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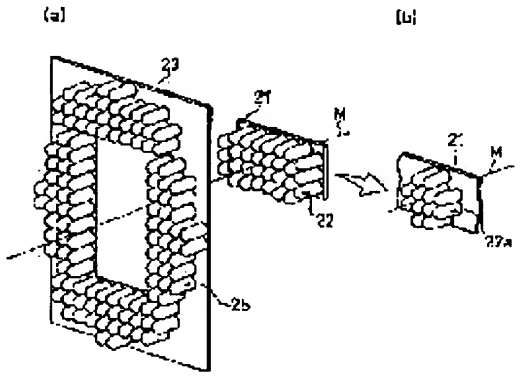
(54) PHOTOGRAPHIC PRINTING DEVICE AND ELECTRONIC IMAGE INPUTTING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a photographic printing device capable of shortening the exposure time in an excellent printing state without causing unevenness and also to obtain a bright image pickup state without having the unevenness by enhancing the use efficiency of the emitted light of a light source and the density of a luminous flux.
SOLUTION: LED groups 22 for condensing light are arrayed within the area of an aspect ratio in accordance with the aspect ratio of a large-sized photographic paper so as to form a light source emitting the light by which the original image of negative film is printed on the photographic paper. When the printing of a small-sized photographic paper is executed, only the LED group 22a for a small size arrayed within the area of the aspect ratio in accordance with that of the small-sized photographic paper emit the light. Also, the LED group 22a for the small size are attached in an inclined state at a substrate 21 so that the directional direction of outgoing light is crossed with an optical axis M. Thus, exposure without having the unevenness is executed while enhancing the use efficiency of the light emitted from the light source.



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CLAIMS

[Claim(s)]
[Claim 1] By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material In the photograph printing equipment which can be burned on sensitive material in the above-mentioned subject-copy image the above-mentioned light source Photograph printing equipment characterized by burning by making the luminescence means which it came to carry out two or more arrays, and a luminescence means different mutually [the spectral characteristic] could be burned on the field, and was arranged in the field of the size according to size emit light.
[Claim 2] By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual Photograph printing equipment characterized by having the optical system which generates the flux of light which makes sensitive material inscribed in this field while forming the field where illumination distribution becomes uniform in the arrangement location of the above-mentioned sensitive material in the photograph printing equipment which can be burned on sensitive material in the above-mentioned subject-copy image.
[Claim 3] By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual Whenever [incident angle / of the light which carries out incidence of the above-mentioned subject-copy image to the above-mentioned information supporter at sensitive material in the photograph printing equipment which can be burned] is photograph printing equipment characterized by having a condensing means to receive the outgoing radiation light of the above-mentioned luminescence means directly, and to condense, without changing.
[Claim 4] The above-mentioned condensing means is photograph printing equipment according to claim 3 characterized by being an optical means using either [at least] reflection of light, or refraction.
[Claim 5] The above-mentioned optical means is photograph printing equipment of a concave lens or a convex mirror according to claim 4 which comes out on the other hand at least, and is characterized by a certain thing.
[Claim 6] The photograph printing equipment characterized by to arrange the above-mentioned luminescence means in a multistage pile in accordance with the optical axis which connects the above-mentioned light source and sensitive material to sensitive material in the photograph printing equipment which can be burned in the above-mentioned subject-copy image by equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual.

[Claim 7] The photograph printing equipment characterized by to form a diffusion plate with a selectable diffusion coefficient on the optical path from the above-mentioned light source to the above-mentioned information supporter in the photograph printing equipment which can be burned in the above-mentioned subject-copy image on sensitive material by equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual.
[Claim 8] The above-mentioned diffusion plate is photograph printing equipment according to claim 7 characterized by having two or more fields where diffusion coefficients differ.
[Claim 9] The above-mentioned luminescence means is photograph printing equipment according to claim 1 to 8 characterized by being light emitting diode.
[Claim 10] The electronic picture input device characterized by coming to prepare for photograph printing equipment according to claim 1 to 9 an image pick-up means to picturize the light from the above-mentioned luminescence means acquired through the above-mentioned information supporter.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention For example, the negative film which recorded the subject-copy image especially about the photograph printing equipment and the electronic picture input device with which photographic-processing equipment, a photograph printer, etc. are equipped, Or by irradiating light at sensitive material through information supporters, such as a liquid crystal display component driven with the picture signal according to a subject-copy image, a PLZT exposure head, and DMD (digital micro mirror device) It is related with the photograph printing equipment which can be burned on sensitive material in the above-mentioned subject-copy image, and the electronic picture input device which performs record to the monitor thru/or record medium of the above-mentioned subject-copy image etc. by irradiating light through the above-mentioned information supporter at an image sensor.
[0002]
[Description of the Prior Art] The photograph printing equipment which can be burned on sensitive material in a subject-copy image is variously proposed by arranging the negative film which recorded the subject-copy image, for example in the front face of sensitive material, and irradiating light through the above-mentioned negative film from the former, at sensitive material.

[0003] In such photograph printing equipment, the halogen lamp is mainly used as the light source of the light which irradiates sensitive material. And the light of a halogen lamp is adjusted to the light suitable for baking by inserting three kinds of modulated light filters corresponding to each color of red, green, and blue with which the spectral characteristics differ mutually into an optical path.
[0004] However, following un-arranging arise in the photograph printing equipment which used the halogen lamp as the light source.
[0005] ** In order that a halogen lamp may emit the heat of unnecessary many to photograph baking, a forced-cooling means like a cooling fan is needed. Since surrounding dust is involved in optical system when a cooling fan is arranged, good baking is checked.
[0006] ** Since the direct-current stability power source for stabilizing the spectral characteristic of a halogen lamp and the cut-off filter for removing infrared light and ultraviolet radiation in a modulated light filter list are needed separately, equipment is enlarged.
[0007] ** A halogen lamp needs to make a halogen lamp always turn on, since the property immediately after lighting is changed, even when not burning. For this reason, the power consumption of a halogen lamp increases. Moreover, when not burning by arranging a shutter style between sensitive material and a halogen lamp, it is necessary to intercept light, and a component part increases.
[0008] ** Since the quantity of light difference in an optical axis and the circumference of it is large, when the dispersion equipment which is made to diffuse the light from a halogen lamp and makes the surface light source required for baking is constituted, a quantity of light loss becomes large.
[0009] ** If the halogen lamp is made to always turn on, when there is much number of sheets

which can be burned, the heat of a halogen lamp has a bad influence on a negative film.
[0010] On the other hand, by the photograph printer indicated by JP,8-22081,A, for example, two or more light emitting diodes (it is only hereafter written as LED) different mutually [the spectral characteristic] as the light source are used, and it has avoided above-mentioned un-arranging [which originates in a halogen lamp by this]. Hereafter, the configuration of the exposure projection section of the photograph printer indicated by the above-mentioned official report is explained roughly.
[0011] As shown in drawing 21 , the above-mentioned photograph printer is equipped with the LED light source 51, the diffusion plate 52, and the printing lens 53 as the exposure projection section. Moreover, a part for one coma of the negative film 54 which is going to burn between the diffusion plate 52 and the printing lens 53 is allotted to the location at which the optical axis A of the printing lens 53 is crossed. Furthermore, the color paper 55 which is sensitive material is arranged on a negative film 54 and the opposite side to the printing lens 53.
[0012] Two or more LED51a which carries out outgoing radiation of the light of red, green, and ****** to the above-mentioned LED light source 51, respectively is arranged in the shape of [of regular intervals in every direction] a matrix. At this time, as shown in this drawing, each LED51a is prepared so that orientation may become parallel to an optical axis A. Moreover, ON/OFF control of each LED51a is carried out according to the individual by the light source mechanical component which is not illustrated, and luminescence time amount and/or luminescence brightness are further controlled by each LED51a of every.
[0013] The above-mentioned diffusion plate 52 is a glass plate (the so-called obscured glass) which formed detailed irregularity, for example, is the purpose which diffuses the outgoing radiation light from the LED light source 51, and is arranged at the optical outgoing radiation side of the LED light source 51.
[0014] In such a configuration, if each LED51a of the LED light source 51 is made to turn on, after diffusing the light by which outgoing radiation was carried out from each LED51a with the diffusion plate 52, it will penetrate in order the negative film 54 and the printing lens 53 which were set to the print position, and will reach a color paper 55. Thereby, image formation of the subject-copy image for one coma recorded on the negative film 54 is carried out to a color paper 55, and it is printed on it.
[0015] Thus, the problem of a proper is solved as follows by the halogen lamp mentioned above by having replaced with the halogen lamp and having used the LED group as the light source.
[0016] (a) Since LED has little calorific value compared with a halogen lamp, a cooling fan and a heat absorbing filter become unnecessary. For this reason, the configuration of the exposure projection section can be simplified. Moreover, since a cooling fan does not have the need, a problem which involves surrounding dust in optical system does not arise. Furthermore, even when there is much number of sheets which can be burned, it can avoid that a negative film is damaged with the heat of the light source.
[0017] (b) Since the power consumption of LED is small, circuitry with simple IC (integrated circuit) control substrate level is employable as DC power supply. Moreover, since modulated light management can be easily performed by controlling red, green, the luminescence brightness of LED of ******, and luminescence time amount, a modulated light filter and a cut-off filter become unnecessary. Consequently, small and lightweight-ization of equipment can be attained.
[0018] (c) Since the quantity of light difference in an optical axis and the circumference of it is not so large as a halogen lamp, the diffusion coefficient of a diffusion plate is smaller than the time of using a halogen lamp as the light source, it ends, and a quantity of light loss can be reduced.
[0019] (d) Since the spectral characteristic stabilizes LED by ON/OFF control in an instant, even if it does not make the light switch on, it can be managed except the time of the need. Therefore, the power consumption of the light source can be sharply reduced rather than the case where a halogen lamp is used. Moreover, since what is necessary is just to turn OFF LED in not burning, it is not necessary to prepare a shutter style between the light source and sensitive material. Consequently, an equipment configuration can be simplified further.
[0020]

[Problem(s) to be Solved by the Invention] However, by the above-mentioned conventional photograph printer which used LED for the light source, since it is not used if the diffusion coefficient of the above-mentioned diffusion plate 52 is not made high, as a result of a quantity of light loss with the diffusion plate 52 becoming large, there is a trouble that the exposure time becomes long. It is as follows when this reason is explained concretely.
[0021] That is, since each LED51a is prepared so that orientation may become parallel to an optical axis as explained with reference to drawing 21 , supposing the diffusion plate 52 is not formed, as shown in drawing 22 , corresponding to arrangement of each LED51a, it is dotted with the luminous-intensity distribution which irradiates a color paper 55 in the shape of a spot. 1 set of this cardiac multiplex circle shown in drawing 22 shows the luminous-intensity distribution by one LED51a, and near the core, it shows that reinforcement becomes weaker as reinforcement is strong and keeps away from a core.
[0022] The nonuniformity of such intensity distribution turns into color nonuniformity in which polka dots was scattered also in the printing condition, and appears. Therefore, in order to suppress generating of color nonuniformity completely, while using a directive (or it is also called an angle of visibility) large thing as LED51a, the surface light source which sets up the diffusion coefficient of the diffusion plate 52 very highly, and emits the diffused light uniformly must be made. That is, if an obscured glass is used for the diffusion plate 52 and the obscured glass in which fluoroscopy has the roughness which is extent which is not made at all with the naked eye is not used, nonuniformity of spot-like intensity distribution cannot be erased.
[0023] Consequently, since the quantity of light loss resulting from the diffusion plate 52 becomes large, problems, like the exposure time of a color paper 55 becomes long, for example will occur unescapable.
[0024] It is what was made in order that this invention might solve the above-mentioned trouble. The purpose In the photograph printing equipment and the electronic picture input device which used LED for the light source raising the use effectiveness of the outgoing radiation light of the light source -- or be burned -- by raising the consistency of the flux of light boiled and used It is in offering the good photograph printing equipment without nonuniformity which can be burned and can acquire a condition by the short exposure time, and the electronic picture input device which can acquire the good image pick-up condition which does not have nonuniformity with slight height in the amount of incident light to an image sensor.
[0025]
[Means for Solving the Problem] In order that the photograph printing equipment concerning invention of claim 1 may solve the above-mentioned technical problem By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material (for example, printing paper) In the photograph printing equipment which can be burned on sensitive material in the above-mentioned subject-copy image the above-mentioned light source It comes to carry out two or more arrays of the luminescence means (for example, light emitting diode) different mutually [the spectral characteristic] on a field. By making the luminescence means arranged in the field of the size according to baking size (for example, standard size or a panorama frame) emit light, it is characterized by burning.
[0026] Since the luminescence means arranged in the field of the size according to the size which can be burned is made to emit light according to the above-mentioned configuration, the quantity of light in the periphery of the sensitive material which tends to be insufficient when burning especially large size can be increased effectively. The uniform field of the illumination distribution moreover generated when luminescence of two or more luminescence means is overlapped can be made into the size which suited the size which can be burned.
[0027] Therefore, since illumination distribution can burn size which suited in a uniform field, the outgoing radiation light of the light source can be efficiently used for baking. Consequently, compaction of the exposure time can be aimed at in the photograph printing equipment which used a luminescence means different mutually [the spectral characteristic] for the light source.

[0028] In addition, a part of above-mentioned luminescence means [at least] may constitute so

that outgoing radiation of the light of orientation which crosses the optical axis which ties the light source and sensitive material may be carried out. The luminescence means attached in the flat-surface substrate by the predetermined angle of inclination is sufficient as the luminescence means which carries out outgoing radiation of the light of orientation which crosses an optical axis, or the luminescence means made to arrange on the spherical surface or a paraboloid centering on an optical axis is sufficient as it.

[0029] In this case, the optical spot formed in the arrangement location of sensitive material only with a luminescence means by which orientation emits a light parallel to an optical axis, as compared with the case where the light source is constituted can be made to superimpose on the optical spot by luminescence of other luminescence means at a big rate. By adjusting the amount of luminescence of the degree of an inclination to the number and the optical axis of a luminescence means by which the degree of this superposition, i.e., orientation, crosses an optical axis, and each luminescence means, in the arrangement location of sensitive material, it is uniform, and it can have sufficient illuminance for baking, and illumination distribution can make the field of a large area. This will be easily understood, if it compares with polka-dot illumination distribution nonuniformity appearing mostly when all orientation is two or more luminescence means parallel to an optical axis as already explained as a Prior art.

[0030] Therefore, since it is easy to obtain the field where illumination distribution is more uniform than the case where all orientation constitutes the light source only from two or more luminescence means parallel to an optical axis, it becomes possible to lower the diffusion coefficient of the diffusion plate arranged before the light source, and the increment in the quantity of light over sensitive material can be promoted further.

[0031] In addition, as the above-mentioned information supporter to which the light from the light source is supplied, the film which recorded the subject-copy image itself, the liquid crystal display component which controls transparency or reflection of light according to the picture signal corresponding to a subject-copy image, and the optical output section are mentioned for the PLZT exposure head of a two-dimensional array, DMD (digital micro mirror device), etc., for example. When a film, an above-mentioned transparency mold liquid crystal display component, or an above-mentioned PLZT exposure head is used as an information supporter, the light from the light source penetrates the above-mentioned information supporter, it is led to sensitive material, and the subject-copy image displayed on the subject-copy image or the above-mentioned transparency mold liquid crystal display component recorded on the above-mentioned film by this can be burned on sensitive material. On the other hand, when a reflective mold liquid crystal display component or DMD is used as an information supporter, the light from the light source is reflected in the above-mentioned information supporter, it is led to sensitive material, and the subject-copy image corresponding to the image information which the above-mentioned information supporter holds by this can be burned on sensitive material.

[0032] In order that the photograph printing equipment concerning invention of claim 2 may solve the above-mentioned technical problem By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual In the photograph printing equipment which can be burned on sensitive material in the above-mentioned subject-copy image, while forming the field where illumination distribution becomes uniform in the arrangement location of the above-mentioned sensitive material, it is characterized by having the optical system which generates the flux of light which makes sensitive material inscribed in this field.

[0033] According to the above-mentioned configuration, since sensitive material is made inscribed in the field where illumination distribution is uniform, illumination distribution can carry out the maximum use of the uniform field at baking. Thereby, the outgoing radiation light of the light source can be efficiently used for baking. Consequently, compaction of the exposure time can be aimed at in the photograph printing equipment which used a luminescence means different mutually [the spectral characteristic] for the light source, acquiring a baking condition without concentration nonuniformity or color nonuniformity.

[0034] In addition, the light source including the luminescence means which carries out outgoing radiation of the light of orientation which crosses an optical axis to a part of two or more luminescence means [at least], a focal distance and a scale factor, opening, etc. can constitute the above-mentioned optical system according to a selectable lens system suitably.
[0035] In order that the photograph printing equipment concerning invention of claim 3 may solve the above-mentioned technical problem By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual Whenever [incident angle / of the light which carries out incidence of the above-mentioned subject-copy image to the above-mentioned information supporter at sensitive material in the photograph printing equipment which can be burned] is characterized by having a condensing means (for example, a concave lens or a convex mirror) to receive the outgoing radiation light of the above-mentioned luminescence means directly, and to condense, without changing.
[0036] According to the above-mentioned configuration, since a condensing means receives the outgoing radiation light of a luminescence means directly and condenses, it can be considered that a condensing means is the new light source. And the condensing function can increase the number of arrangement of a luminescence means from the case where a condensing means is not established. Consequently, the quantity of light of the light which burns can be increased.
[0037] Moreover, if the luminescence means when not establishing a condensing means makes equal exposure area when presupposing that the arrangement location of a condensing means is irradiated, and outgoing radiation area of the condensing means when increasing the number of arrangement of a luminescence means and establishing a condensing means, it is easy to fulfill the conditions of not changing whenever [incident angle / of the light which carries out incidence to an information supporter]. That is, it is because it can avoid changing whenever [incident angle / of the light which carries out incidence to an information supporter] by selection of angle of reflection or angle of refraction if the optical means using either [at least] reflection of light or refraction is used as a condensing means.
[0038] Thus, the exposure time over various kinds of baking sizes can be shortened, without changing optical system other than the light source and a condensing means, since only the quantity of light can be made to increase without changing whenever [incident angle / of the light which carries out incidence to an information supporter].
[0039] The photograph printing equipment concerning invention of claim 4 is characterized by a condensing means according to claim 3 being an optical means using either [at least] reflection of light, or refraction, in order to solve the above-mentioned technical problem.
[0040] By the above-mentioned configuration, without changing whenever [incident angle / of the light which carries out incidence to an information supporter] by selection of the angle of reflection in an optical means, or angle of refraction, only the quantity of light is made to increase and the exposure time over various kinds of baking sizes can be shortened, using optical system other than the light source and an optical means as it is as the operation by the configuration of claim 3 was explained.
[0041] In order to solve the above-mentioned technical problem, on the other hand, a concave lens or a convex mirror comes out at least, and, as for the photograph printing equipment concerning invention of claim 5, the optical means according to claim 4 is characterized by a certain thing.
[0042] According to the above-mentioned configuration, insides, such as the spherical surface which counters the optical incidence side of a concave lens by adopting a concave lens as an optical means using the condensing function by refraction of a concave lens, or a paraboloid, can be made to arrange many luminescence means. The exposure time over various kinds of baking sizes can be shortened by the thereby comparatively easy optical design.
[0043] Moreover, the reflector of a convex mirror can be turned to a sensitive-material side, and insides, such as the spherical surface which counters the reflector of a convex mirror, or a paraboloid, can be made to arrange many luminescence means by adopting a convex mirror as an optical means. Thereby, since outgoing radiation of the light of a luminescence means will be

carried out towards the opposite side the arrangement side of sensitive material, it becomes easy to reduce the stray light more unnecessary than the configuration which adopted the concave lens to baking.

[0044] In order that the photograph printing equipment concerning invention of claim 6 may solve the above-mentioned technical problem By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual In accordance with the optical axis which connects the above-mentioned light source and sensitive material to sensitive material in the photograph printing equipment which can be burned in the above-mentioned subject-copy image, it is characterized by arranging the above-mentioned luminescence means in a multistage pile.

[0045] If even 0 does not have the light transmittance of a luminescence means according to the above-mentioned configuration, the outgoing radiation quantity of light towards sensitive material can be increased by arranging a luminescence means in a multistage pile in accordance with an optical axis. Consequently, the exposure time over various kinds of baking sizes can be shortened.

[0046] In order that the photograph printing equipment concerning invention of claim 7 may solve the above-mentioned technical problem By equipping the information supporter holding subject-copy image information with the light source which irradiates light, and irradiating light through the above-mentioned information supporter at sensitive material with the luminescence means equipped with two or more kinds of spectral characteristics according to the individual In the photograph printing equipment which can be burned on sensitive material in the above-mentioned subject-copy image, it is characterized by forming a diffusion plate with a selectable diffusion coefficient on the optical path from the above-mentioned light source to an information supporter.

[0047] In the above-mentioned configuration, if it can be burned and size usually changes, since the distance between sensitive material and the light source will change or the field angle (breadth) of the light which carries out incidence will change to sensitive material, the luminous density of the incident light which reaches sensitive material changes. So, in this invention, since the diffusion coefficient of a diffusion plate is selectable, for example, luminous density falls relatively, as a diffusion coefficient is set up low in baking of a panorama frame, the increment in the exposure time can be prevented. That is, compared with the case where a diffusion plate with one kind of diffusion coefficient is used for two or more kinds of baking sizes, the exposure time can be made into the shortest in various baking sizes.

[0048] In addition, it is aimed also at the diffusion plate using the highly efficient ingredient which can change a diffusion coefficient with applied voltage not only like a diffusion plate which was equipped with two or more fields where a diffusion coefficient differs from a diffusion plate with a selectable diffusion coefficient but like a polymer dispersed liquid crystal.

[0049] In order that the photograph printing equipment concerning invention of claim 8 may solve the above-mentioned technical problem, the diffusion plate according to claim 7 is characterized by having two or more fields where diffusion coefficients differ.

[0050] According to the above-mentioned configuration, a diffusion coefficient can be easily changed by choosing the field which has a desired diffusion coefficient. Selection of the above-mentioned field is realizable with comparatively simple devices of a diffusion plate, such as a slide and rotation.

[0051] In order that the photograph printing equipment concerning invention of claim 9 may solve the above-mentioned technical problem, the luminescence means according to claim 1 to 8 is characterized by being light emitting diode.

[0052] According to the above-mentioned configuration, in order that light emitting diode may tend to control brightness and luminescence time amount, it becomes easy to change the amount of luminescence and to adjust concentration nonuniformity and color nonuniformity. Moreover, while it is possible to choose the angle of visibility of light emitting diode suitably, whenever [setting-angle / of the light emitting diode to a substrate] can be changed, and the

angle of inclination of the orientation to an optical axis can be changed easily. By this, the illumination distribution explaining especially claims 1 and 2 becomes easy [setting up the breadth of a uniform field appropriately].

[0053] Moreover, compared with a halogen lamp, calorific value and power consumption are small, and since the spectral characteristic is stable, components, such as a cooling fan, a heat absorbing filter, a modulated light filter, and a cut-off filter, become unnecessary. Moreover, power consumption is small, since the spectral characteristic is stable, the direct-current stability power source is unnecessary, and the simple DC power supply using an integrated circuit can be used. Thereby, a miniaturization and lightweight-ization of photograph printing equipment are realizable. Moreover, since the spectral characteristic is stable, the thing which is the need and which is done for ON/OFF control at any time by the way becomes possible. Power consumption can be made still smaller while the need of preparing a shutter style in front of sensitive material is lost by this.

[0054] The electronic picture input device concerning invention of claim 10 is characterized by coming to prepare for photograph printing equipment according to claim 1 to 9 an image pick-up means (for example, CCD camera) to picturize the light from the above-mentioned luminescence means acquired through the above-mentioned information supporter, in order to solve the above-mentioned technical problem.

[0055] If sensitive material is transposed to an image pick-up means by combining with the configuration of a publication at either of claims 1 or 9 according to the above-mentioned configuration, for every various baking sizes, it is in the condition that the use effectiveness of the outgoing radiation light of the light source is the highest, and the subject-copy image corresponding to the image information which an information supporter holds can be picturized in the condition that there is moreover neither concentration nonuniformity nor color nonuniformity. The screen of the monitor which displays an image based on the output of this result, for example, an image pick-up means, can be made brighter than before.

[0056]

[Embodiment of the Invention] [Gestalt 1 of operation] It will be as follows if one gestalt of operation of this invention is explained based on drawing 1 thru/or drawing 10 .

[0057] As shown in drawing 2 , the photograph printer 1 concerning this operation gestalt is equipped with the printing optical system 6 which built in the below-mentioned light source section 5 (refer to drawing 4) equivalent to the light source of the printing part 2 equivalent to the photograph printing equipment of this invention, the development section 3, a dryer part 4, and this invention in one, and performs a series of processings for printing the image of a negative film on sensitive material. A printing part 2 is a system which exposes sensitive material through a negative film, as explained in full detail later. The development section 3 is a system which is immersed in various processing cisterns in order in the sensitive material which finished baking by the printing part 2, and performs a development. A dryer part 4 is a system which discharges the photoprint which was made to dry sensitive material [finishing / a development], separated for every coma, and was completed.

[0058] The above-mentioned printing part 2 consists of above-mentioned printing optical system 6, a delivery device which a negative film 7 (refer to drawing 4) does not illustrate, and a conveyance device of the printing paper 8 as a sensitive material, as shown in drawing 3 . The printing optical system 6 is arranged by the right angle, and irradiates light at the negative film 7 which recorded the subject-copy image so that the longitudinal direction of the photograph printer 1 may be intersected. In this case, the negative film 7 is functioning as an information supporter holding subject-copy image information. In addition, about the detailed configuration of the printing optical system 6, it mentions later.

[0059] The conveyance device of printing paper 8 is equipped with paper magazine 9a and 9b which contains printing paper 8 in the shape of a roll, and two or more conveyance rollers 10a-10e. Paper magazine 9a and 9b were arranged in the upper part of a printing part 2 according to the class of size of the printing paper 8 dealt with by the photograph printer 1, and has contained the printing paper 8 of mutually different size. By rotation of conveyance roller 10a, 10b, and 10 c.10d, the printing paper 8 contained by the paper magazines 9a or 9b is conveyed in

an image formation location, and is sent out to the development section 3 after exposure. In addition, by the operator, the size of the printing paper 8 used as the candidate for a print may choose suitably, and may perform an automatic switch based on the size information recorded on the negative film 7 at the time of photography, and the size information inputted into the photograph printer 1 from the outside.

[0060] Next, the configuration of the printing optical system 6 mentioned above is explained to a detail. The printing optical system 6 of this invention is equipped with the LED (Light Emitting Diode) light source 11 for condensing light and the LED light source 12 for the diffused lights, the mirror tunnel 13, the condenser lens 14, ANM (Auto Nega Mask)15, the printing lens 16, and the reflective mirror 17 as the above-mentioned light source section 5 in order on the optical axis M along the travelling direction of light, as shown in drawing 4 . The diffusion plate 18 (diffusion means) is arranged in the outgoing radiation side of the light of the LED light source 11 for condensing light, and the LED light source 12 for the diffused lights in one, respectively. In addition, the LED light source 11 for condensing light, a condenser lens 14, the printing lens 16, and the diffusion plate 18 constitute the optical system of a publication in a claim.

[0061] The above-mentioned LED light source 11 for condensing light has the role which carries out outgoing radiation of the light (condensing light) which can be burned on printing paper 8 mainly in the subject-copy image of a negative film 7, can be burned and moves an optical-axis M top according to size. The above-mentioned LED light source 12 for the diffused lights has the role which carries out outgoing radiation of the light (diffused light) which is made to color concave heights, such as a blemish attached mainly to the negative film 7, to printing paper 8, and can be burned, and the location on an optical axis M is being fixed.

[0062] In addition, generally, if baking only by condensing light is performed, an abnormality part like the blemish of a negative film or dust will be reflected to printing paper, if the diffused light is added to a condensing light, you may set in the photograph industry that the blemish and dust of a negative film stop being reflected easily, and it is known.

[0063] The above-mentioned mirror tunnel 13 is the cylinder of the truncated four-sided pyramid form where the inside became a mirror, and has the function to lead efficiently the diffused light which the LED light source 12 for the diffused lights emitted to a negative film 7. Moreover, a condenser lens 14 is fixed to the raised bottom section of the mirror tunnel 13, and the light by which outgoing radiation is carried out from the mirror tunnel 13 is condensed to the negative film 7 conveyed by ANM15. Thereby, the use effectiveness of light increases and a quantity of light loss becomes very small. When a condenser lens 14 is used, the light source section 5 is positioned based on the light source design of a condensing formula in consideration of the physical relationship and the focal distance of the printing lens 16 and a condenser lens 14.

[0064] In addition, the light from the light source section 5 may be made to condense by using a concave mirror in addition to condenser lens 14. However, the layout of the optical system accompanying arrangement of a concave mirror becomes very complicated in this case. Therefore, the configuration of optical system can be simplified by using a condenser lens 14 as a condensing means.

[0065] The above ANM15 has the automatic conveyance function of a negative film 7, and the limited function of an exposure field. Furthermore, the adjustable function of an exposure field can also be given. The coma image made into the purpose of a negative film 7 is conveyed by opening of ANM15 by the automatic conveyance function of ANM15, and is detected and suspended by ANM15. And the negative film 7 which finished conveyance of all coma images and exposure is discharged from ANM15.

[0066] The above-mentioned printing lens 16 carries out image formation of the light which penetrated the negative film 7 to printing paper 8. With this operation gestalt, two or more printing lenses 16 are formed according to the size of printing paper 8, they are among the optical path between the light source section 5 and printing paper 8, and insert and remove are suitably carried out to the location which serves as a predetermined distance from printing paper 8. In addition, it is good also as a zoom lens to which the single printing lens 16 is moved in accordance with an optical axis M according to the size of printing paper 8.

[0067] It has the above-mentioned reflective mirror 17 in order to bend the course of the light

which penetrated the printing lens 16 at a right angle and to lead to printing paper 8. Thereby, as explained with reference to drawing 2 , the layout which brings the light source section 5 is employable to the longitudinal direction of the photograph printer 1. Like the gestalt of this operation, such a layout enables the attitude of the LED light source 11 for condensing light in accordance with an optical axis M, and when there is the need of securing the optical-axis M lay length of a printing part 2 for a long time, it is suitable.

[0068] Next, the configuration of the LED light source 11 for condensing light is further explained to a detail. As shown in drawing 1 (a), the LED light source 11 for condensing light is equipped with the LED group 22 (luminescence means) for condensing light which 30 LED crowded and was attached as an example on the rectangle-like substrate 21. The top view when seeing the LED group 22 for condensing light in this drawing 1 (a) from an optical outgoing radiation side is shown in drawing 5 (a). As shown in this drawing, the LED group 22 for condensing light consists of two or more LED which carries out outgoing radiation of red and the green and blue light, respectively. That is, such LED differs in the spectral characteristic mutually corresponding to each color.

[0069] Furthermore, near the center section of the LED group 22 for condensing light, as shown in drawing 1 (b) and drawing 5 (b), it is referred to as LED group 22for small sizes a (luminescence means) which carries out outgoing radiation of the condensing light for burning small size, and for every color, a total of 12 LED of a same number individual crowds, and it is allotted. In addition, when all LED of the LED group 22 for condensing light is made to emit light, baking of large size is performed so that it may explain in full detail later.

[0070] As LED group 22for small sizes a shows to drawing 6 , it is four red LED22R1 -R4 to the perimeter of a center section. It is allotted in the condition of having touched mutually and is red LED22R1 -R4 further. Where a perimeter is touched Four green LED22G1 -G4 While being allotted to point symmetry (symmetrical about the optical axis M of the printing lens 16 if it puts in another way), they are four blue LED 22B1 - B4. It is allotted to point symmetry. Thereby, they are red LED 22R1, green LED22G1, and blue LED 22B1. Three pieces are making 1 set. Also about the remaining LED, LED group 22a for small sizes is constituted from three pieces by nothing and a total of 4 sets of LED in 1 set for every color.

[0071] By being leaned and attached in a substrate 21 so that that orientation may intersect an optical axis M, LED which makes these 3 sets [1] is matched with the specific field of printing paper 8, and mainly irradiates that corresponding field so that it may explain in full detail later. the case where saw printing paper 8 to the travelling direction of light, and quadrant I-IV is specifically set to a counterclockwise rotation from an upper right quadrant centering on an optical axis M as shown in drawing 4 -- Quadrant I -- Red LED -- 22R1, green LED22G1, and blue LED 22B1 It is matched. the same -- Quadrant II -- red LED22R -- 2, green LED22G2 and blue LED22 B-2, and quadrant III **** -- red -- LED22R3, green LED22 G3 and blue LED 22B3, and Quadrant IV -- red LED22R -- 4, green LED22G4, and blue LED22 B4 It is matched, respectively.

[0072] Next, each LED which constitutes LED group 22a for small sizes leans only a predetermined include angle to an optical axis M, and is attached in the substrate 21 so that it may direct toward the optical axis M of the printing lens 16, as it already touched. This point is explained using drawing 7 .

[0073] Drawing 7 shows the perspective view which extracted a part of LED group 22for small sizes matched with quadrant IV of printing paper 8 for convenience of explanation a. As shown in this drawing, LED of each of LED group 22a for small sizes has the inclination of an include angle theta to the optical axis M. that is, if the level plane of projection X in this drawing is seen, it understands -- as -- LED of each of LED group 22a for small sizes -- an optical axis M -- receiving -- horizontal -- include angle theta 1 only -- while leaning, if the perpendicular plane of projection Y is seen, it understands -- as -- an optical axis M -- receiving -- a perpendicular direction -- include angle theta 2 only -- it leans. in addition, include-angle theta1 = include angle theta 2 you may be .

[0074] In addition, the above-mentioned include angle theta is suitably chosen in 0 - 30 degrees in consideration of terms and conditions, such as a focal distance of the lens to be used,

aperture, print size, and a baking scale factor.
[0075] Thus, when arranged LED group 22a for small sizes emits light, as shown in drawing 4 , it is the horizontal Wx length V1. It burns to printing paper 8' of the standard size which is 89mmx127mm. On the occasion of baking, red, green, and the amount of luminescence of ****** LED (product of brightness and luminescence time amount) are usually controlled to be set to red:green:blue =5-6:2:1. This ratio is set up based on that the quantity of light of red light runs short most in photograph baking, and photosensitivity of blue glow being the highest.
[0076] On the other hand, a total of 30 LED is attached in the substrate 21 of the LED light source 11 for condensing light as mentioned above. Therefore, LED group 22only for large sizes b (luminescence means) which consists of 18 LED except the above-mentioned LED group 22a for smallness sizes which consists of 12 LED will be arranged at a time at nine both wings of LED group 22a for small sizes, as shown in drawing 5 (a) and (b). These numbers are mere examples and the number which can arrange LED is prescribed by the size beside [vertical x] a substrate 21, and the size of the LED item to be used. For example, the size beside [vertical x] a substrate 21 is chosen on the basis of horizontal Wx length V2 =89mmx254mm of the printing paper 8 of a panorama frame, as shown in drawing 4 .
[0077] Moreover, every time the above-mentioned LED group 22only for large sizes b inclines to an optical axis M like LED group 22a for small sizes, it is not broken, but it is attached in the substrate 21 so that it may be parallel to an optical axis M. Although quality control becomes simple, if only a fitter [as opposed to a substrate 21 in this gentleman] adjusts the amount of luminescence, he may have the same inclination as LED group 22a for small sizes.
[0078] Furthermore, eight of nine LED in a wing of LED group 22only for large sizes b are Red LED, and remaining one piece is green LED arranged in the center of an edge of a substrate 21. Red:green:blue which red, green, and the number ratio of ****** LED were set to red:green:blue =20:6:4=10:3:2, and described above as the LED group 22 whole for condensing light by this = it is almost equal to the ratio of 5-6:2:1.
[0079] In addition, although not illustrated with the gestalt of this operation, the use effectiveness of the light which it can be burned and the LED group 22 for condensing light sometimes emits can be raised by forming the reflective film in the LED clamp face of a substrate 21.
[0080] Next, the details of the configuration of the LED light source 12 for the diffused lights are explained. As the LED light source 12 for the diffused lights is shown in drawing 1 (a), the LED group 25 for the diffused lights which changes from much LED to the rectangle frame-like substrate 23 with which rectangle-like opening was formed in the center is attached. The above-mentioned opening of a substrate 23 is prepared in order the core is in agreement with an optical axis M and to pass the outgoing radiation light of the LED group 22 for condensing light as it is. Moreover, as shown in drawing 4 , rectangle-like opening is formed also in the center of the wrap diffusion plate 18 for the same purpose in the front face of the LED group 25 for the diffused lights. In addition, each LED of the LED group 25 for the diffused lights is attached in the substrate 23 so that orientation may be parallel to an optical axis M.
[0081] Next, the array of the red, green, and ****** LED which constitutes the LED group 25 for the diffused lights is explained. As shown in drawing 5 (a), the number of LED of the LED group 25 for the diffused lights is about 4 times of the LED number of the LED group 22 for condensing light, for example, has become 120 pieces. And every 30 LED per side is arranged by 4 tiering to four sides of opening of the rectangle in a substrate 23. That is, ten LED is arranged in the 1st step and every 2nd step, eight pieces are arranged in the 3rd step and two LED is arranged in the 4th step. Thus, it not only prevents being able to burn irregularity, such as a blemish of a negative film, on printing paper, but by arranging much LED to multistage, it becomes easy the hardness of the print which finished baking, and in other words for the printed image to adjust the visibility meaning a degree called Sharp or software.
[0082] In addition, the numerousness and photosensitive high blue LED is set up as little, and the number ratio of red, green, and ****** LED should just set up green LED in those middle for the red LED who runs short of the quantity of light, as already explained. However, about the amount of luminescence, the product of brightness and luminescence time amount is controlled to be set

to red:green:blue =5-6:2:1. Moreover, what is necessary is to allot more red LED near the optical axis M, and just to keep away Blue LED from an optical axis M most relatively about the physical relationship of red, green, and ****** LED. Therefore, Blue LED is allotted to the 4th step to one side of opening of the rectangle in a substrate 23.

[0083] By the way, the use effectiveness of the light which the LED group 25 for the diffused lights emits can be raised by forming the reflective film also in the LED clamp face of a substrate 23 like a substrate 21.

[0084] In the above-mentioned configuration, before [which is depended on the photograph printer 1] developing negatives by the ability being burned, a test print is performed if needed. In this test print, printing paper 8 is exposed, without inserting a negative film 7 into an optical path at the time of starting of the photograph printer 1, or the negative film only for [gray 1 color] test prints is inserted into an optical path, and processing (it is hereafter called a grape lint) which can be burned on the whole surface of printing paper 8 in a gray color by the light from the light source section 5 is performed, for example.

[0085] Then, a concentration meter etc. detects for every quadrant which mentioned above concentration distribution of the test print which develops the printing paper 8 concerned and is obtained, and the brightness and luminescence time amount of each LED of the LED group 22 for condensing light are automatically adjusted by manual input of the amount of amendments so that concentration nonuniformity may be lost based on that result.

[0086] Then, a negative film 7 is inserted into an optical path, and while positioning the coma which burns, actuation of ANM15 restricts the exposure range of a negative film 7 proper. Then, according to the size which can be burned, paper magazine 9a or paper magazine 9b is chosen, and printing paper 8of printing paper [of large size] 8 or small size ' is conveyed in an exposure location.

[0087] When it can come, simultaneously burns for example, small size, each of the LED light source 11 for condensing light and the printing lens 16 is positioned in the location for small size baking on an optical axis M. That is, as shown in drawing 8 (a) and drawing 9 (b), the printing lens 16 combined with diaphragm 16a is arranged in the location near [case / where large size is burned] printing paper 8', and the LED light source 11 for condensing light is positioned in the method advance location of the forefront near a condenser lens 14.

[0088] In addition, the location on the LED light source 12 for the diffused lights, the mirror tunnel 13, a condenser lens 14, a negative film 7, the reflective mirror 17, and the optical axis M of printing paper 8' is always being fixed.

[0089] Thus, completion of a setup of each part of an exposure system performs the usual baking finish. That is, when burning small size, as shown in drawing 5 (b), LED group 22for small sizes a and the LED group 25 for the diffused lights are turned on. That is, LED group 22only for large sizes b is controlled by the OFF condition. In addition, although a part of LED near the four corners of opening of a substrate 23 is controlled by drawing 5 (b) by the OFF condition about the LED group 25 for the diffused lights, the amount of luminescence of the LED group 25 for the diffused lights is set up according to the hardness of the print for which it asks so that it may explain below.

[0090] First, work of the LED group 25 for the diffused lights is explained. After diffusing the outgoing radiation light of the LED group 25 for the diffused lights with the diffusion plate 18, it is reflected by the mirror tunnel 13 and it irradiates a negative film 7 efficiently by the random incident angle. When irregularity like a blemish or dust exists in a negative film 7, a part of incident light is refracted with this irregularity, and printing paper 8' is reached. Thereby, the image of this irregularity does not become a white omission, but since it colors, it cannot be conspicuous and it can be carried out.

[0091] Moreover, after the outgoing radiation light of LED group 22a for small sizes is overlapped on a part of outgoing radiation light of the LED group 25 for the diffused lights and it irradiates a negative film 7, image formation of it is carried out to printing paper 8'. Therefore, the hardness of a print is changeable by adjusting the amount of luminescence of the LED group 25 for the diffused lights on balance with the amount of luminescence of LED group 22a for small sizes. What is necessary is just to make [many] the amount of the said luminescence that what is

necessary is just to more specifically lessen the amount of luminescence of the LED group 25 for the diffused lights in order to obtain a hard print (clear print of a profile), in order to obtain a soft print (print which obscured the profile).
[0092] Next, the light which LED group 22a for small sizes emitted explains the condition of irradiating printing paper 8'. Twelve multiplex circles which carried out eccentricity to the optical axis M are shown in drawing 9 (a). Each circle expresses the optical spot which each of 12 LED of LED group 22a for small sizes forms in the location of printing paper 8' on an optical axis M.
[0093] As drawing 7 explained that each circle was carrying out eccentricity, 12 LED of LED group 22a for small sizes is because it is mutually leaned symmetrically to the optical axis M. namely, the red LED -- 22R1, green LED22G1, and blue LED 22B1 The core of the optical spot by outgoing radiation light is relatively unevenly distributed in Quadrant I in quadrant I-IV of printing paper 8'. the same -- red LED22R -- 2, green LED22G2, and blue LED22 B-2 The core of the optical spot by outgoing radiation light relative -- Quadrant II -- unevenly distributed -- red -- LED22R3, green LED22 G3, and blue LED 22B3 The core of the optical spot by outgoing radiation light quadrant III red LED22R -- 4, green LED22G4, and blue LED22 B4 The core of the optical spot by outgoing radiation light is unevenly distributed in Quadrant IV, respectively.
[0094] Consequently, small-circle field D1 where all the circles overlapped in the center of 12 multiplex circles just because each circle was carrying out eccentricity to the optical axis M It is formed. such a small-circle field D1 **** -- distribution of an illuminance -- about -- he is Mr. one.
[0095] This point is perceived and it is the above-mentioned small-circle field D1. While setting up the focal distance and scale factor of a condenser lens 14 and the printing lens 16 so that it may be mostly inscribed in so that printing paper 8' of small size may be settled inside at about one cup namely By setting up the angle of inclination over the optical axis M of each LED of LED group 22a for small sizes, baking of small size without concentration nonuniformity or color nonuniformity is attained, and can use most efficiently the light of LED group 22a for small sizes further. If it puts in another way, in baking of small size, the exposure time in the condition that there is neither concentration nonuniformity nor color nonuniformity can be shortened most.
[0096] Next, in burning large size, as shown in drawing 8 (b) and drawing 10 (b), it positions each of the LED light source 11 for condensing light, and the printing lens 16 in the location for large size baking on an optical axis M. That is, as shown in drawing 8 (b), the printing lens 16 is arranged in the location more distant than the case where small size is burned from printing paper 8, and the LED light source 11 for condensing light is positioned in a back location distant from a condenser lens 14.
[0097] In this way, completion of a setup of each part of an exposure system turns on all the LED groups 22 for condensing light also including LED group 22only for large sizes b, as shown in drawing 5 (a). In addition, it is as having explained work of the LED group 25 for the diffused lights in baking of small size.
[0098] Here, the light which the LED group 22 for condensing light emitted explains the condition of irradiating printing paper 8, like the case of LED group 22a for small sizes. 30 multiplex circles which carried out eccentricity to the optical axis M are shown in drawing 10 (a). Each circle expresses the optical spot which each of 30 LED of the LED group 22 for condensing light forms in the location of the printing paper 8 on an optical axis M. The multiplex circle of drawing 10 (a) piles up the multiplex circle formed in 12 multiplex circles of drawing 9 (a) of 18 LED of LED group 22only for large sizes b.
[0099] Consequently, longwise abbreviation ellipse form field D2 where all the circles overlapped in the center of 30 multiplex circles just because the LED group 22 for condensing light was doubled with the rate of an aspect ratio of the printing paper 8 of large size and it arranged in the oblong rectangle-like substrate 21 while each circle formed of LED group 22a for small sizes was carrying out eccentricity to the optical axis M It is formed. such an abbreviation ellipse form field D2 **** -- distribution of an illuminance -- about -- he is Mr. one.
[0100] This point is perceived and it is the above-mentioned abbreviation ellipse form field D2. While setting up the focal distance and scale factor of a condenser lens 14 and the printing lens 16 so that it may be mostly inscribed in so that the printing paper 8 of large size may be settled

inside at about one cup namely By setting up the angle of inclination over the optical axis M of each LED of LED group 22a for small sizes, and the rate of an aspect ratio of a substrate 21, baking of large size without concentration nonuniformity or color nonuniformity is attained, and can use most efficiently the light of the LED group 22 for condensing light further. If it puts in another way, in baking of large size, the exposure time in the condition that there is neither concentration nonuniformity nor color nonuniformity can be shortened most.

[0101] Thus, by the photograph printer 1 of this invention, whether it constitutes LED group 22a for small sizes from only 12 LED or constitutes the LED group 22 for condensing light from only 30 LED, concentration distribution of printing paper 8' or the baking field of printing paper 8 can be made into homogeneity. Therefore, since there is little number of LED which should be controlled and it ends, the effectiveness that it becomes very easy by the brightness of each LED or control of luminescence time amount to amend concentration nonuniformity and color nonuniformity is also acquired.

[0102] And even if it uses LED with directivity narrower than LED used for the conventional light source (for example, an angle of visibility becomes 45 or less degrees), the field (D1 and D2) of uniform concentration distribution can be obtained by restricting the exposure field by luminescence of each LED like drawing 9 (a) or drawing 10 (a). Consequently, since it becomes possible similarly to make the diffusion coefficient of the diffusion plate 18 low, the quantity of light loss of the LED group 22 for condensing light can be controlled. Thereby, the number of LED which constitutes the LED group 22 for condensing light can shorten the exposure time enough at least.

[0103] In addition, although the obscured glass which has roughness to the extent that it can see through mostly with the naked eye as a diffusion plate 18 can be used, if LED which has a suitable angle of visibility (for example, before or after 180 degrees) is used, the diffusion plate 18 is omissible from the front face of the LED group 22 for condensing light.

[0104] Moreover, as long as the field (D1 and D2) of uniform concentration distribution can be obtained, the inclination to the optical axis M of LED group 22a for small sizes can be set to arbitration.

[0105] Furthermore, since three-piece blue [in LED group 22a for small sizes / the red green, and blue / 1 set] LED is matched with each quadrant I-IV of printing paper 8, it can also change freely Y(yellow) -M (Magenta) and C (cyanogen) concentration for every quadrant I-IV by changing the amount of luminescence of each color LED in each class.

[0106] As mentioned above, in order to be burned and to make it neither concentration nonuniformity nor color nonuniformity appear in a condition like the conventional light source which arranged LED in parallel with an optical axis according to the configuration of the light source section 5 of this invention, there is no need of forming the high diffusion plate of a diffusion coefficient in the front face of much LED. Moreover, under the effect of the aberration generated by the design of optical system, when LED is arranged in parallel with an optical axis, since the side edge of printing paper becomes insufficient [the quantity of light] more relatively than a center section, the problem of the complicatedness of control that there is the need of enlarging the amount of luminescence of LED which irradiates the side edge of printing paper is not produced with the configuration of the light source section 5 of this invention, either.

[0107] In addition, although it constituted from a gestalt of this operation so that the light in the condition that orientation inclined to the optical axis M about LED group 22for small sizes a might be emitted, this configuration is not essential to this invention. That is, a configuration indispensable to this invention is the point of having arranged the LED group 22 for condensing light on the substrate 21 of the size which could be burned and suited size. Therefore, LED group 22a for small sizes may be attached in a substrate 21 so that it may become parallel to an optical axis M. In this case, although there is the need of gathering the diffusion coefficient of the diffusion plate 18 for color nonuniformity prevention, the lack of the quantity of light which tends to take place around the printing paper 8 of large size is more effectively [than before] suppliable by making the whole LED group 22 for condensing light emit light.

[0108] Moreover, while being able to increase effectively the surrounding quantity of light of the printing paper 8 of standard size similarly by making not only LED group 22for small sizes a but

LED group 22only for large sizes b emit light suitably also in baking of standard size, compaction of the exposure time can be aimed at.
[0109] Furthermore, the installation to the substrate 21 of LED group 22only for large sizes b may be leaned to an optical axis M besides supposing that it is parallel to an optical axis M. In this case, it is good to set up the angle of inclination of LED group 22a for small sizes more smallish so that the effectiveness by the inclination of LED group 22a for small sizes may be suppressed.
[0110] [Gestalt 2 of operation] It will be as follows if the gestalt of other operations of this invention is explained based on drawing 11 thru/or drawing 14 . In addition, the same sign is appended to the configuration explained with the above mentioned gestalt 1 of operation, and the configuration which has the same function, and the explanation is omitted.
[0111] The printing optical system 6 concerning the gestalt of this operation differs in the gestalt 1 of operation in the configuration of the LED light source for condensing light. Namely, LED light source 11' for condensing light of the gestalt of this operation As shown in drawing 11 (a) thru/or (c), it has the LED group 26 (luminescence means) for condensing light which increased the number of LED instead of the LED group 22 for condensing light in the gestalt 1 of operation. Between the diffusion plate 18 and the LED group 26 for condensing light It has the composition that the concave lens 27 (condensing means) which condenses the outgoing radiation light of the LED group 26 for condensing light was formed.
[0112] The above-mentioned LED group 26 for condensing light is arranged so that a concave lens 27 may be surrounded. A paraphrase arranges each LED of the LED group 26 for condensing light so that it may be in agreement with two or more incident light ways where it migrates to the whole incidence range of incident light which is condensed by the diffusion plate 18 through a concave lens 27, and the orientation of each LED spreads from a concave lens 27 in a radial to an incidence side.
[0113] The base or head of each LED can more specifically be arranged the shape of the spherical surface, and in the shape of a paraboloid. Since the distance from the head of each LED to a concave lens 27 can be set up almost equally while being able to carry out incidence of the light which turns the direction of outgoing radiation of light to a concave lens 27, and the LED group 26 for condensing light emits by this to a concave lens 27 efficiently, the amount of incident light to the concave lens 27 of each LED can be mostly made regularity. Moreover, when the base or head of each LED has been arranged in the shape of the spherical surface, the effectiveness of becoming simple like the fitter to the substrate of each LED is added.
[0114] In addition, the LED number of the LED group 26 for condensing light is horizontal and the thing which carried out actual size to vertical both about the LED number of the LED group 22 for condensing light shown in drawing 5 (a). Furthermore, it is not different from the thing explaining the LED group 22 for condensing light shown in drawing 5 (a) also about the red of each LED, green, and a blue separate number ratio.
[0115] According to the above-mentioned configuration, the light by which outgoing radiation was carried out from the LED group 26 for condensing light penetrates a concave lens 27, and is condensed by the diffusion plate 18. The configuration shown in drawing 12 which transposed LED light source 11' for condensing light to the LED light source 11 for condensing light of the gestalt 1 of operation here is referred to. When the consistency of the flux of light which carries out incidence to the diffusion plate 18 is measured, in spite of not changing, it turns out that the consistency of the part to which the arrangement number of direction of LED light source 11' for condensing light of LED increased, and the flux of light increases whenever [over the field of the diffusion plate 18 of the flux of light which carries out incidence to the diffusion plate 18 / incident angle]. That is, like the configuration shown in drawing 12 , the light source nonuniformity, concentration nonuniformity, or color nonuniformity on printing paper 8 will not arise, but, moreover, the light income of printing paper 8 will improve.
[0116] When only the LED number of the LED group 26 for condensing light is increased as an example of a comparison, without forming a concave lens 27, the situation of the distribution of light by which outgoing radiation is carried out from the diffusion plate 18 is shown in drawing 13 (a) thru/or (c). In addition, it sets all over drawing and is T1 and T2. Expressing the distance of

the base of the LED component on an optical axis M, and the diffusion plate 18, the curvilinear graphic form currently drawn in the direction of a condenser lens 14 from the diffusion plate 18 shows the breadth of distribution of the light to which outgoing radiation of the area is carried out from the diffusion plate 18, and expresses typically the intensity of light to which outgoing radiation of the die length from the diffusion plate 18 to a curve was carried out.

[0117] It sets in the configuration shown in drawing 13 (a) which is in a basic condition, and the configuration shown in drawing 13 (b) is distance T1. The LED number of the LED group 26 for condensing light is increased without making it change. In this case, even if it increases the LED number, luminous density does not increase from the diffusion plate 18 only by the distribution of light by which outgoing radiation is carried out spreading.

[0118] Moreover, it sets in the configuration shown in drawing 13 (a) which is in a basic condition, and the configuration shown in drawing 13 (c) is distance T1. Long distance T2 It carries out and the LED number is increased. In this case, although breadth does not carry out like drawing 13 (b) in the distribution of light by which outgoing radiation is carried out from the diffusion plate 18, since the distance of each LED and the diffusion plate 18 becomes long, by the time it reaches the diffusion plate 18, a quantity of light loss will arise. For this reason, the rise of luminous density is seldom expectable.

[0119] That is, as shown in drawing 11 (a) thru/or (c), the luminous density of the light which carries out outgoing radiation from the diffusion plate 18 can be efficiently raised by arranging a concave lens 27.

[0120] Next, adjustment of light source nonuniformity is explained below. In drawing 11 (a), it is an incidence side from a condenser lens 14, and is a two-dot chain line K1 and K2. The field across which it faced shows the range of incident light which reaches the upper limit of printing paper 8 with the printing lens 16, after the light which carried out incidence to the condenser lens 14 penetrates the lower limit of a negative film 7. Similarly, in drawing 11 (b), it is an incidence side from a condenser lens 14, and is a two-dot chain line K3 and K4. The field across which it faced shows the range of the incident light condensed in the center of printing paper 8, and is an incidence side from a condenser lens 14 in drawing 11 (c), and is two-dot chain line K5 and K6. The field across which it faced shows the range of the incident light condensed by the lower limit of printing paper 8.

[0121] Moreover, in drawing 11 (a) thru/or (c), two or more arrow heads currently drawn from the point P of the upper limit of the diffusion plate 18 show the direction and strength of distribution in this point P. [light] Outgoing radiation of the light in this point P is carried out from the LED component located in the topmost part of the LED group 26 for condensing light. The luminous-intensity distribution in Point P is strong, so that it is a direction near the direction of the light which carries out incidence to the point P of the diffusion plate 18 from a concave lens 27.

[0122] A part for Mitsunari of the direction among distributions of light [in / on drawing 11 (a) and / Point P] where intensity distribution are the strongest is a two-dot chain line K1. The shown optical path is progressed and the point of the upper limit of printing paper 8 is irradiated. A part for Mitsunari of the direction among distributions of light [in / on drawing 11 (b) and / Point P] where intensity distribution are a little weaker than the case of drawing 11 (a) is a two-dot chain line K3. It passes along the optical path between opticals axis M, and the point of the center of printing paper 8 is irradiated. A part for Mitsunari of the direction where intensity distribution are quite weak among distributions of light [in / on drawing 11 (c) and / Point P] is two-dot chain line K5 and K6. Chuo Line and two-dot chain line K5 It passes along the optical path of a between and the point of the lower limit of printing paper 8 is irradiated.

[0123] That is, near the upper limit section of printing paper 8 is understood that the exposure from LED located near the upper part of the LED group 26 for condensing light (field shown by U1 in drawing 11 (a)) is dominant. Similarly, the exposure from LED to which, as for near the lower limit section of printing paper 8, the exposure from LED to which near the center section of printing paper 8 is located near the center section of the LED group 26 for condensing light (field shown by U2 in drawing 11 (a)) is located near the lower part of the LED group 26 for condensing light (field shown by U3 in drawing 11 (a)) by becoming dominant becomes dominant.

[0124] Therefore, light source nonuniformity can be adjusted by controlling separately the amount of luminescence of LED of the field which irradiates this field dominantly according to the field which light source nonuniformity has produced.
[0125] In addition, as shown in drawing 14 (a) thru/or (c), instead of the above-mentioned concave lens 27, a convex mirror 28 can be used as a condensing means, and light of the light source can also be considered as the configuration which condenses to the diffusion plate 18. In this case, while arranging a convex mirror 28 on an optical axis M so that a convex may turn to the diffusion plate 18, LED group 26' for condensing light (luminescence means) is arranged so that the convex side of a convex mirror 28 may be surrounded. Moreover, the diffusion plate 18 is arranged to a convex mirror 28 at the same side as LED group 26' for condensing light. That is, it is reflected in a convex mirror 28 and the light which opening is formed in the center section and carried out outgoing radiation of LED group 26' for condensing light from LED group 26for condensing light ' is condensed by the diffusion plate 18 through the above-mentioned opening. Also in such a configuration, the same operation and effectiveness as the configuration equipped with the above-mentioned concave lens 27 are done so.
[0126] As mentioned above, the LED number is made to increase in the photograph printing equipment concerning this operation gestalt by arranging a concave lens 27 between the diffusion plate 18 and the LED group 26 for condensing light, and forming the LED group 26 for condensing light in a configuration which encloses this concave lens 27. That is, the quantity of light which carries out incidence to the diffusion plate 18 is made to increase by increasing the LED number in the LED group 26 for condensing light. Moreover, the luminous density in the diffusion plate 18 is raised by condensing with a concave lens 27. Thereby, the light source nonuniformity on printing paper 8 cannot arise, but the brightness on printing paper 8 can be raised further.
[0127] Moreover, since correspondence relation between the field on printing paper 8 and the arrangement field of LED in the LED group 26 for condensing light is, according to the condition of light source nonuniformity, light source nonuniformity can be amended by adjusting the amount of luminescence of an LED component.
[0128] [Gestalt 3 of operation] It will be as follows if the gestalt of the operation of further others of this invention is explained based on drawing 15 . In addition, the same sign is appended to the configuration explained with the above mentioned gestalt of each operation, and the configuration which has the same function, and the explanation is omitted.
[0129] The printing optical system 6 concerning the gestalt of this operation differs in the gestalt 1 of operation in the configuration of the LED light source for condensing light. That is, the LED light source 31 for condensing light of the gestalt of this operation is equipped with the LED group 32 (luminescence means) for condensing light which made LED the multistage pile and increased the number as shown in drawing 15 (a) thru/or (c). The light which carried out outgoing radiation from LED which perceived that the configuration of this LED group 32 for condensing light had a transparent LED body, for example, was arranged in the lower stage in the case of the two-step pile penetrates LED arranged in the upper stage, and it carries out incidence to the diffusion plate 18. The path of light until it reaches printing paper 8 from the diffusion plate 18 becomes being completely the same as that of drawing 11 (a) thru/or the explanation based on (c) in the gestalt 2 of operation.
[0130] Since the luminescence area of the LED light source 31 for condensing light is practically equal as compared with the LED light source 11 for condensing light shown in drawing 12 , although the include angle to the field of the diffusion plate 18 of the flux of light which carries out incidence to the diffusion plate 18 hardly changes, it can raise the luminous density. That is, like the configuration shown in drawing 12 , the light source nonuniformity on printing paper 8 will not arise, but the brightness on printing paper 8 will improve further.
[0131] Moreover, near the upper limit section of printing paper 8 is understood that the exposure from LED located near the upper part of the LED group 32 for condensing light (field shown by W1 in drawing 15 (a)) is dominant like the gestalt 2 of operation. Similarly, the exposure from LED to which, as for near the lower limit section of printing paper 8, the exposure from LED to which near the center section of printing paper 8 is located near the center section of the LED group

32 for condensing light (field shown by W2 in drawing 15 (a)) is located near the lower part of the LED group 32 for condensing light (field shown by W3 in drawing 15 (a)) by becoming dominant becomes dominant.
[0132] Therefore, light source nonuniformity can be exactly adjusted by controlling separately the amount of luminescence of LED of the field which irradiates this field dominantly according to the field which light source nonuniformity has produced.
[0133] In addition, although it was the configuration which made LED in the LED group 32 for condensing light the two-step pile with the gestalt of this operation, it is also possible to make it the configuration repeated to three or more steps.
[0134] As mentioned above, the photograph printing equipment concerning the gestalt of this operation is making LED in the LED group 32 for condensing light into a multistage pile, and is making the number of LED in the LED light source 31 for condensing light increase. That is, the quantity of light which carries out incidence to the diffusion plate 18 is made to increase by making the number of LED in the LED light source 31 for condensing light increase. Moreover, since whenever [incident angle / of the light to the diffusion plate 18] does not change, the amount of incident light to the diffusion plate 18 carries out net increase, and luminous density rises. Thereby, the light source nonuniformity on printing paper 8 cannot arise, but the brightness on printing paper 8 can be raised further.
[0135] Moreover, since correspondence relation between the field on printing paper 8 and the arrangement field of LED in the LED group 32 for condensing light is, according to the condition of light source nonuniformity, light source nonuniformity can be exactly amended by adjusting the amount of luminescence of LED according to an individual.
[0136] [Gestalt 4 of operation] It will be as follows if the gestalt of the operation of further others of this invention is explained based on drawing 16 . In addition, the same sign is appended to the configuration explained with the above mentioned gestalt of each operation, and the configuration which has the same function, and the explanation is omitted.
[0137] The printing optical system 6 concerning this operation gestalt is the point of not using a condenser lens 14, and differs from the gestalt 2 of operation. That is, as shown in drawing 16 (a), the light by which outgoing radiation was carried out to instead of [which does not use a condenser lens 14] from the diffusion plate 18 by making very narrow spacing of a negative film 7 and the diffusion plate 18 has composition which irradiates a negative film 7 without a loss.
[0138] Also in the gestalt of this operation, near the upper limit section of printing paper 8 is understood that the exposure from LED located near the upper part of the LED group 26 for condensing light (field shown by Z1 in drawing 16 (a)) is dominant like the gestalten 2 and 3 of operation. Similarly, the exposure from LED to which, as for near the lower limit section of printing paper 8, the exposure from LED to which near the center section of printing paper 8 is located near the center section of the LED group 26 for condensing light (field shown by Z2 in drawing 16 (a)) is located near the lower part of the LED group 26 for condensing light (field shown by Z3 in drawing 16 (a)) by becoming dominant becomes dominant.
[0139] Therefore, light source nonuniformity can be exactly adjusted by controlling separately the amount of luminescence of LED of the field which irradiates this field dominantly according to the field which light source nonuniformity has produced.
[0140] Moreover, as shown in drawing 16 (b), between the LED group 26 for condensing light, and the diffusion plate 18, like the gestalt 2 of operation, a concave lens 27 can be arranged and it can also consider as the configuration which increased the LED number in the LED group 26 for condensing light. According to this configuration, the luminous density in the diffusion plate 18 can be efficiently raised like the explanation in the gestalt 2 of operation. In addition, Z4 illustrated to drawing 16 (b), Z5, and Z6 The shown field is the above Z1, Z2, and Z3, respectively. The shown field is supported.
[0141] Moreover, it is also possible to consider as the configuration equipped with the convex mirror 28 instead of the concave lens 27 and the configuration which makes a multistage pile LED in the LED group 32 for condensing light like the gestalt 3 of operation like a configuration of to be shown in drawing 14 (a) thru/or (c).
[0142] As mentioned above, acquiring the operation effectiveness equivalent to the gestalt 1 of

operation thru/or the operation effectiveness by the configuration in 3, the photograph printing equipment concerning the gestalt of this operation can make easy the part which does not form a condenser lens 14, and an optical design, and can reduce the cost of photograph printing equipment itself.

[0143] [Gestalt 5 of operation] It will be as follows if the gestalt of the operation of further others of this invention is explained based on drawing 17 . In addition, the same sign is appended to the configuration explained with the above mentioned gestalt of each operation, and the configuration which has the same function, and the explanation is omitted.

[0144] The printing optical system 6 concerning the gestalt of this operation has composition which transposed the diffusion plate 18 attached in the LED light source 11 for condensing light to the diffusion plate 33 (diffusion means) to which a diffusion coefficient can be changed according to print size in the configuration of the gestalt 1 of operation, as shown in drawing 17 (a) and (b).

[0145] With the gestalt of this operation, since it burns, for example to 2 kinds of printing paper 8' of standard size and a panorama frame, and 8, according to it, the diffusion coefficient of the diffusion plate 33 can be changed to two kinds. The diffusion plate 33 has two fields where diffusion coefficients differ, making this diffusion plate 33 slide or by rotating the diffusion plate 33 around a shaft parallel to an optical axis M, changes the field which the light of the LED light source 11 for condensing light penetrates, and, more specifically, changes a diffusion coefficient.

[0146] In addition, even if it forms in two or more diffusion plates 33 the field where diffusion coefficients differ, it cannot be overemphasized that a desired field can be arranged on an optical axis M by a slide or rotation. Furthermore, the field which changed the diffusion coefficient in one field may be prepared like it not only setting one kind of diffusion coefficient as one field of the diffusion plate 33, but making low the diffusion coefficient in the periphery section of one field, and making high a diffusion coefficient [/ near the center section].

[0147] According to the above-mentioned configuration, in case it burns to the printing paper 8 of a panorama frame, as shown in drawing 17 (b), the LED light source 11 for condensing light is kept away from a condenser lens 14. Therefore, a diffusion coefficient required in this case, since light source nonuniformity in the diffusion plate 33 is not produced may be smaller than the case where baking to printing paper 8' of standard size as shown in drawing 17 (a) is performed. That is, since the amount of incident light in a condenser lens 14 becomes less so that the LED light source 11 for condensing light and a condenser lens 14 are far, it is good to suppress diffusion of light using the field to the printing paper 8 of a panorama frame where a diffusion coefficient [in / it can be burned and / in the time / the diffusion plate 33] is low. Thereby, when using the diffusion plate of the diffusion coefficient corresponding to the time of printing to printing paper 8' of standard size, compared with the case where a diffusion plate with the diffusion coefficient of the middle level which is adapted for a criterion and panorama both sizes is used, the outgoing radiation light of the LED group 22 for condensing light can be used efficiently, and the exposure time can be shortened.

[0148] In addition, with the gestalt of this operation, as a means to change a diffusion coefficient, although the diffusion plate 33 was used, if it is the material into which other means may be used as long as it has a spreading effect, and a diffusion coefficient can be intentionally changed like a polymer dispersed liquid crystal, exchange of a diffusion plate will become unnecessary.

[0149] [Gestalt 6 of operation] It will be as follows if the gestalt of the operation of further others of this invention is explained based on drawing 18 thru/or drawing 20 . In addition, the same number is appended to the configuration used with the gestalt of previous operation, and the configuration which has the same function, and the explanation is omitted.

[0150] With the gestalt of this operation, as shown in drawing 18 (a), (b), or drawing 19 , in the printing optical system 6 explained with the gestalten 1-5 of operation, the CCD (charge coupled device) camera 42 (image pick-up means) which picturizes the light which penetrated the negative film 7 independently [printing paper 8] is arranged, and the case where an electronic picture input device is constituted is explained.

[0151] First, with the printing lens 16 combined with diaphragm 16a, CCD camera 42 shown in drawing 18 (a) and (b) is built in in an attaching part 43, and is juxtaposed, and insert and remove

are carried out into the optical path which ties the light source section 5 and printing paper 8 by making an attaching part 43 slide perpendicularly to an optical axis M. When an attaching part 43 slides so that the printing lens 16 may be located on an optical axis M, it has opening 43a in the optical incidence side of the printing lens 16, and this attaching part 43 has opening 43b in the optical outgoing radiation side of the printing lens 16, respectively so that the light from the light source section 5 may penetrate the printing lens 16 and can reach printing paper 8. Moreover, when an attaching part 43 slides so that CCD camera 42 may be located on an optical axis M, the attaching part 43 has opening 43c in the optical incidence side of CCD camera 42 so that the light from the light source section 5 may penetrate a negative film 7 and may be led to CCD camera 42.

[0152] Moreover, as mentioned above, instead of carrying out unitization of the printing lens 16 and CCD camera 42, as shown in drawing 19 , the printing lens 16 and CCD camera 42 may be formed independently, and LED light source 11for condensing light a and condenser lens 14a of CCD camera 42 dedication may be prepared. in this case, to printing paper 8, the common negative film conveyance way w can also be formed, and the conveyance way which conveys a negative film which is different by the print system and the monitor system can be looked like [the print system centering on an optical axis M, and the centering on optical-axis M' monitor system to CCD camera 42], respectively, and can also be established in them.

[0153] Above-mentioned CCD camera 42 consists of the objective lens 44 and CCD45 of a movable zoom type along with an optical axis M or M'. An objective lens 44 carries out image formation of the incident light to CCD45. CCD45 has two or more photo detectors, and detects the quantity of light of the light which carried out incidence through the objective lens 44 for every photo detector. Each above-mentioned photo detector outputs the electrical signal according to the above-mentioned quantity of light to an image display control section etc., and a monitor display is performed based on this.

[0154] In the above-mentioned configuration, as shown in drawing 18 (b), CCD camera 42 is inserted by migration of an attaching part 43 on an optical axis M. Since an attaching part 43 serves as a shutter which intercepts the light which faces to printing paper 8 at this time, printing paper 8 may be arranged on an optical axis M.

[0155] When amendment of concentration nonuniformity or color nonuniformity is performed and the negative film 7 of gray 1 color has been arranged on an optical axis M, according to the flow shown in drawing 20 , processing of amendment is performed in the following procedures. First, if the light source section 5 is turned on (it outlines as step 11 and the following S11), the light from the light source section 5 will carry out incidence to CCD45 through a condenser lens 14, a negative film 7, and an objective lens 44. Here, CCD45 detects the quantity of light of the light which carried out incidence for every photo detector, and outputs the detecting signal according to light income to a control section (S12). Thereby, a control section recognizes the concentration distribution in the light-receiving side of CCD45.

[0156] Next, a control section judges whether concentration nonuniformity and color nonuniformity are in tolerance based on the above-mentioned concentration distribution (S13). In S13, if each above-mentioned nonuniformity is in tolerance, nonuniformity will not be amended but the processing itself will be completed (S14).

[0157] On the other hand, if each nonuniformity is not in tolerance, a control section will control the amount of luminescence of each LED of the light source section 5 by S13 so that concentration nonuniformity and/or color nonuniformity are amended (S15). Moreover, while an operator checks on a monitor the image which CCD camera 42 picturized, amendment data may be inputted manually.

[0158] Thus, when nonuniformity is amended in S15, processing of S11-S13, and S15 is repeated, and processing of amendment is completed until each nonuniformity becomes in tolerance (S14).

[0159] Next, once the light source section 5 is turned OFF, as shown in drawing 18 (a), the printing lens 16 is inserted by migration of an attaching part 43 on an optical axis M. Then, the light source section 5 is turned ON and baking to printing paper 8 is performed.

[0160] The configuration shown in drawing 18 can be burned, performs amendment of

concentration nonuniformity and color nonuniformity in front, and when baking of each coma image is put in block and it performs it continuously after amendment termination, it is suitable.
[0161] On the other hand, checking on a monitor the image which can be burned, and performs amendment of concentration nonuniformity and color nonuniformity upwards in front, and CCD camera 42 picturized for every coma image, the configuration shown in drawing 19 is suitable, when inputting amendment data manually. It is the configuration shown in drawing 18 , and is because it is possible to perform amendment based on ["be burned"] a monitor to coincidence according to the configuration shown in drawing 19 although both-way migration of the attaching part 43 must be carried out for every coma image if it is going to input amendment data manually for every coma image.
[0162] As mentioned above, the applicability of this invention is extensible as follows with the configuration equipped with CCD camera 42.
[0163] Before performing baking to printing paper 8, adjustment of the check of the concentration nonuniformity by the grape lint explained with the gestalt 1 of operation and the amount of luminescence of each LED can be directly performed [1st] based on the output of CCD45 by arranging CCD camera 42 on an optical axis M or M'. Moreover, it can adjust to coincidence, looking at the image displayed on the monitor, also in case an operator inputs the amount of amendments manually. Thereby, the time amount which adjustment takes can be shortened. Consequently, when the number of LED which constitutes the LED group 22 for condensing light became fewer by this invention, the effectiveness to which adjustment of concentration nonuniformity or color nonuniformity became easy can be heightened much more.
[0164] Since the monitor display of the coma image of a negative film 7 or a positive film can be carried out [2nd], even if it cannot be burned on printing paper 8 as a photoprint, a monitor image can be seen at once by a lot of people. Thereby, it can use for the presentation for appreciation or a meeting.
[0165] The amount of luminescence of LED becomes possible [recording the image data obtained through CCD camera 42 on record media, such as MO (magneto-optic-recording medium) and DVD (digital videodisc), and also saving it instead of a photo album in the condition of having been controlled proper,] so that there may be neither concentration nonuniformity nor color nonuniformity in the 3rd. Furthermore, the amount of luminescence of LED can be controlled and the image data to which the visual effect was changed variously can also be recorded on the above-mentioned record medium.
[0166] In addition, it cannot be overemphasized by allotting the LED light source 12 for the diffused lights to the light source section 5 that the effectiveness which is not included in the image in which irregularity, such as a blemish attached to the negative film 7, carries out image formation to CCD45, and the effectiveness that the visibility of the image which carries out image formation to CCD45 can be changed can be acquired like the gestalt 1 of operation.
[0167] In addition, although the negative film 7 which recorded the subject-copy image itself was taken up as an information supporter holding subject-copy image information with the gestalt of each operation explained above, it is not necessarily limited to this. As an information supporter, you may be the liquid crystal display component which controls transparency or reflection of light according to the picture signal corresponding to a subject-copy image, a PLZT exposure head, DMD (digital micro mirror device), etc., for example.
[0168] The above-mentioned liquid crystal display component comes to pinch a liquid crystal layer with the transparence substrate (for a TFT substrate to be called) with which TFT (Thin Film Transistor) which is an active component has been arranged in the shape of a matrix corresponding to each pixel, and the transparent opposite substrate with which the counterelectrode was formed, and, in the case of a reflective mold liquid crystal display component, it becomes the structure which has arranged the reflecting plate on the outside of the above-mentioned liquid crystal panel further. The electrical potential difference impressed to a liquid crystal layer according to the picture signal corresponding to a subject-copy image is controlled by such liquid crystal display component for every pixel, and a subject-copy image is displayed by changing the permeability of the light from the light source section 5 which penetrates a liquid crystal layer for every pixel. Therefore, it becomes possible to be able to burn

this displayed subject-copy image on printing paper 8. In addition, a color picture can be burned if the above-mentioned liquid crystal panel is equipped with the color filter of R, G, and B. In addition, as the above-mentioned liquid crystal panel, you may be TN (Twisted Nematic) liquid crystal panel, a STN (Super Twisted Nematic) liquid crystal panel, etc.

[0169] Moreover, what allots the PLZT component which is a transparence ferroelectricity ceramic ingredient between the polarizing plates (a polarizer and analyzer) of a pair, is equipped with two or more shutter sections (optical output section) which control transparency of light according to a picture signal, and has the above-mentioned shutter section two-dimensional in this invention is suitable for the above-mentioned PLZT exposure head. 1-x/4 O3 obtained by adding a lanthanum and carrying out a hotpress with the above-mentioned PLZT component by what (PZT) made the solid solution lead zirconate (PbZrO3) and lead titanate (PbTiO3) by the suitable ratio (Zry Ti1-y) (Pb1-x Lax) It is the system solid solution. On the other hand, DMD is arranging two or more micro mirrors which can rock minute size two-dimensional, adjusting the inclination of each micro mirror according to image data, and changing the reflective direction of light, and supply of the light to sensitive material is controlled.

[0170] When a transparency mold liquid crystal display component or a PLZT exposure head is used as an information supporter While the light from the light source section 5 penetrates the above-mentioned information supporter and is led to printing paper 8, when a reflective mold liquid crystal display component or DMD is used as an information supporter The light from the light source section 5 will be reflected in the above-mentioned information supporter, it will be led to sensitive material, and the subject-copy image corresponding to the image information which the above-mentioned information supporter holds can be burned anyway on sensitive material.

[0171] The gestalt of each operation shown above is a mere example, and neither the configuration of each part material, nor structure, the number, etc. are what was restricted above, and it is also possible to combine the configuration of the gestalt of each operation.

[0172]

[Effect of the Invention] The photograph printing equipment concerning invention of claim 1 is the configuration that a luminescence means by which the light sources differ mutually [the spectral characteristic] burns by making the luminescence means which came to carry out two or more arrays, could be burned on the field, and was arranged in the field of the size according to size emit light, as mentioned above.

[0173] So, illumination distribution is uniform in the arrangement location of sensitive material, and can form a field with sufficient illuminance for baking in it in the size which suited the size of baking. Therefore, the outgoing radiation light of the light source can be efficiently used for baking. Consequently, in the photograph printing equipment which used a luminescence means different mutually [the spectral characteristic] for the light source, the effectiveness that compaction of the exposure time can be aimed at is done so.

[0174] The photograph printing equipment concerning invention of claim 2 is the configuration equipped with the optical system which generates the flux of light which makes sensitive material inscribed in this field while forming the field where illumination distribution becomes uniform in the arrangement location of the above-mentioned sensitive material as mentioned above.

[0175] So, since sensitive material is made inscribed in the field where illumination distribution is uniform, illumination distribution can carry out the maximum use of the uniform field at baking. Thereby, the outgoing radiation light of the light source can be efficiently used for baking. Consequently, in the photograph printing equipment which used a luminescence means different mutually [the spectral characteristic] for the light source, the effectiveness without concentration nonuniformity or color nonuniformity that compaction of the exposure time can be aimed at is done so, being burned and acquiring a condition.

[0176] As for the photograph printing equipment concerning invention of claim 3, whenever [incident angle / of the light which carries out incidence to an information supporter] is the configuration of having had a condensing means to have received the outgoing radiation light of the above-mentioned luminescence means directly, and to condense, without changing, as

mentioned above.
[0177] So, the effectiveness that the exposure time over various kinds of baking sizes can be shortened is done, without changing optical system other than the light source and a condensing means, since only the quantity of light can be made to increase without changing whenever [incident angle / of the light which carries out incidence to an information supporter].
[0178] The photograph printing equipment concerning invention of claim 4 is characterized by a condensing means according to claim 3 being an optical means using either [at least] reflection of light, or refraction as mentioned above.
[0179] So, in addition to the effectiveness by the configuration of claim 3, the effectiveness that the exposure time over various kinds of baking sizes can be shortened is done by comparatively easy optical design called selection of the angle of reflection in an optical means, or angle of refraction, using optical system other than the light source and an optical means as it is.
[0180] As mentioned above, on the other hand, a concave lens or a convex mirror comes out at least, and, as for the photograph printing equipment concerning invention of claim 5, the optical means according to claim 4 is characterized by a certain thing.
[0181] So, the exposure time over various kinds of baking sizes can be shortened by the comparatively easy optical design of choosing suitably the refraction property of a concave lens, and the reflection property of a convex mirror. Moreover, since the light of a luminescence means can be turned to the opposite side the arrangement side of sensitive material and can carry out outgoing radiation by adopting a convex mirror as an optical means, the effectiveness of becoming easy to reduce the unnecessary stray light is collectively done so to baking rather than the configuration which adopted the concave lens.
[0182] The photograph printing equipment concerning invention of claim 6 is the configuration which arranged the above-mentioned luminescence means in the multistage pile as mentioned above in accordance with the optical axis which ties the above-mentioned light source and sensitive material.
[0183] So, if even 0 does not have the light transmittance of a luminescence means, by arranging a luminescence means in a multistage pile in accordance with an optical axis, the outgoing radiation quantity of light towards sensitive material can be increased, and the effectiveness that the exposure time over various kinds of baking sizes can be shortened will be done.
[0184] The photograph printing equipment concerning invention of claim 7 is the configuration of having formed the diffusion plate with a selectable diffusion coefficient as mentioned above on the optical path from the above-mentioned light source to an information supporter.
[0185] So, compared with the case where a diffusion plate with one kind of diffusion coefficient is used for two or more kinds of baking sizes, the effectiveness that the exposure time can be made into the shortest in various baking sizes is done.
[0186] The photograph printing equipment concerning invention of claim 8 is the configuration that the above-mentioned diffusion plate was equipped with two or more fields where diffusion coefficients differ, as mentioned above.
[0187] So, a diffusion coefficient can be easily changed by choosing the field which has a desired diffusion coefficient. In addition to the effectiveness by the configuration according to claim 7, selection of the above-mentioned field does so the effectiveness that it is realizable with comparatively simple devices of a diffusion plate, such as a slide and rotation.
[0188] The photograph printing equipment concerning invention of claim 9 is characterized by a luminescence means according to claim 1 to 8 being light emitting diode as mentioned above.
[0189] So, in order that light emitting diode may tend to control brightness and luminescence time amount, it becomes easy to change the amount of luminescence and to adjust concentration nonuniformity and color nonuniformity. Moreover, while it is possible to choose the angle of visibility of light emitting diode suitably, whenever [setting-angle / of the light emitting diode to a substrate] can be changed, and the angle of inclination of the orientation to an optical axis can be changed easily. The breadth of the field where the intensity distribution explaining especially claims 1 and 2 are uniform is easily changeable with this. Moreover, compared with a halogen lamp, calorific value and power consumption are small, and when the spectral characteristic is stable, in addition to the effectiveness by the configuration according

to claim 1 to 8, the effectiveness that various troubles of a halogen lamp are solvable is done so.

[0190] The electronic picture input device concerning invention of claim 10 is the configuration which equipped photograph printing equipment according to claim 1 to 9 with an image pick-up means to picturize the light from the above-mentioned luminescence means acquired through the above-mentioned information supporter, as mentioned above.
[0191] So, if sensitive material is transposed to an image pick-up means by combining with the configuration of a publication at either of claims 1 or 9, for every various baking sizes, it is in the condition that the use effectiveness of the outgoing radiation light of the light source is the highest, and the subject-copy image of a film can be picturized in the condition that there is moreover neither concentration nonuniformity nor color nonuniformity. As a result, for example, the effectiveness that the screen of the monitor which displays an image based on the output of an image pick-up means can be made brighter than before, it does so.

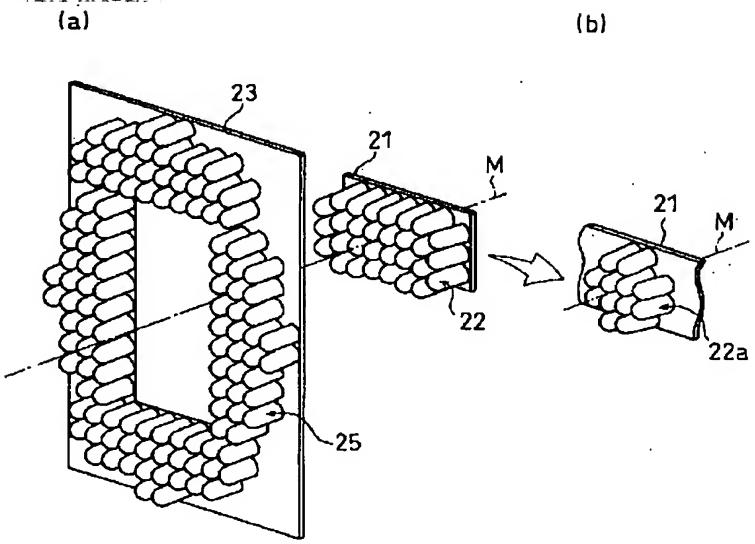
[Translation done.]

* NOTICES *

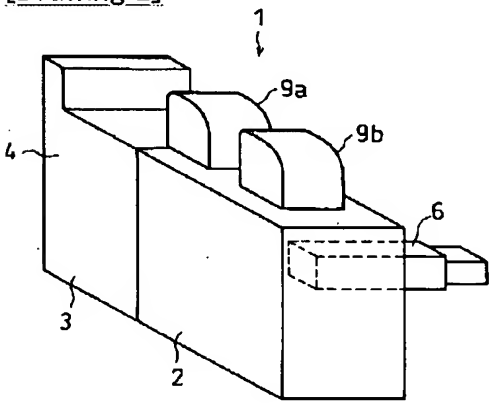
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

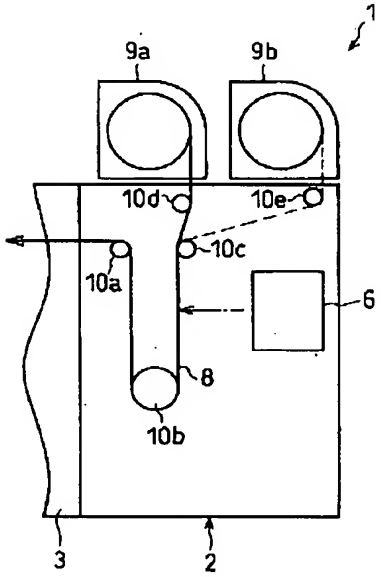
[Drawing 1]



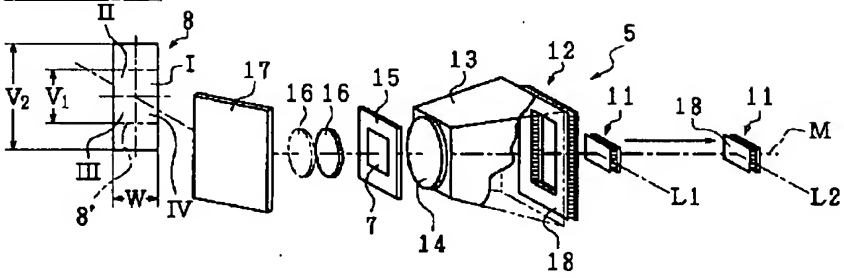
[Drawing 2]



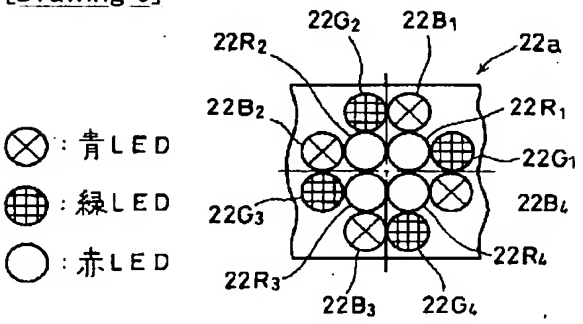
[Drawing 3]



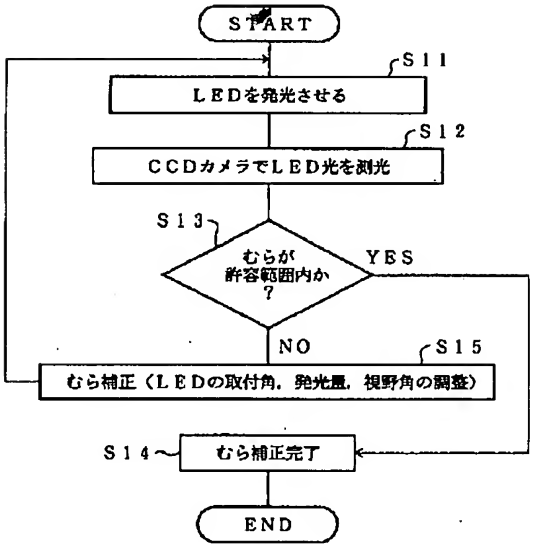
[Drawing 4]



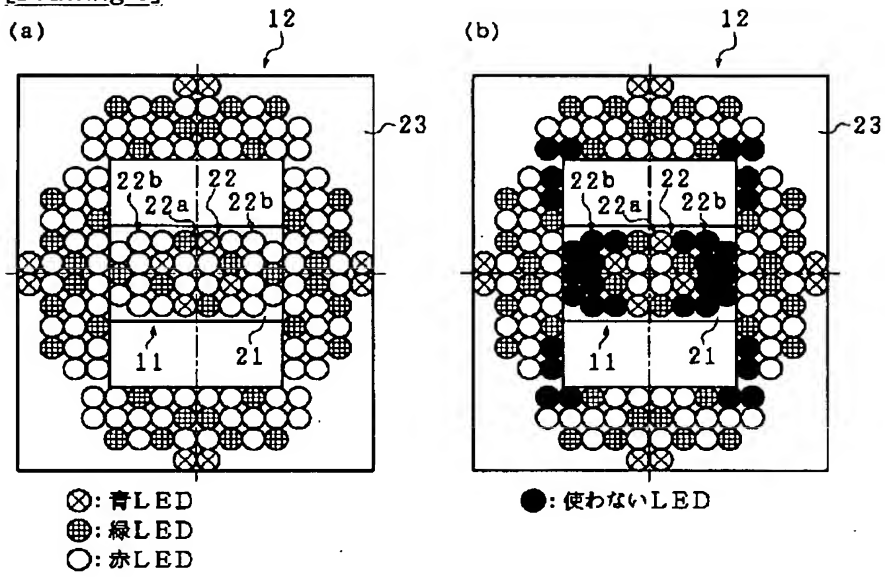
[Drawing 6]



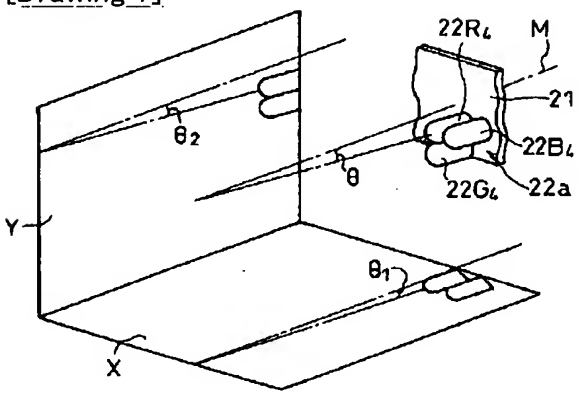
[Drawing 20]



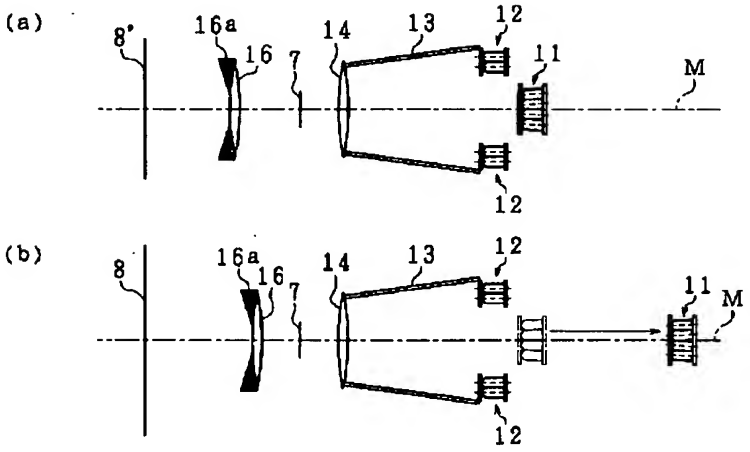
[Drawing 5]



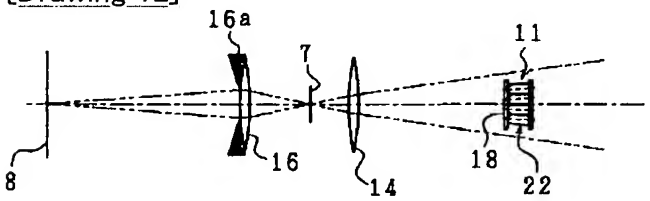
[Drawing 7]



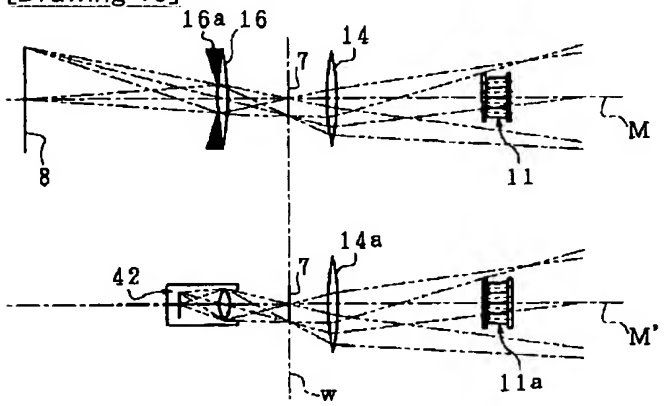
[Drawing 8]



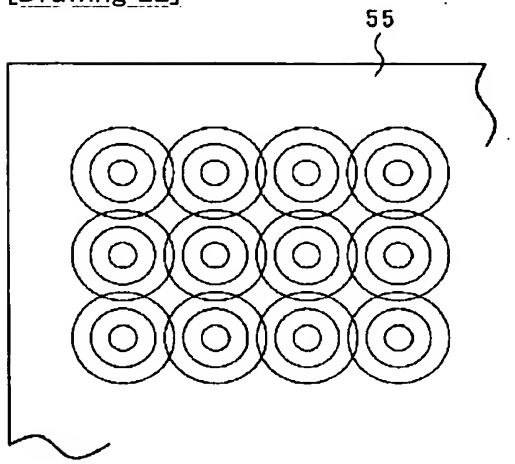
[Drawing 12]



[Drawing 19]

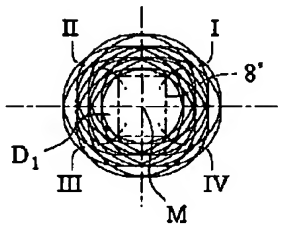


[Drawing 22]

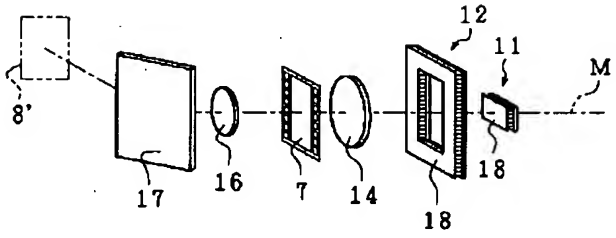


[Drawing 9]

(a)

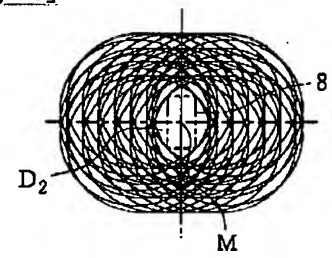


(b)

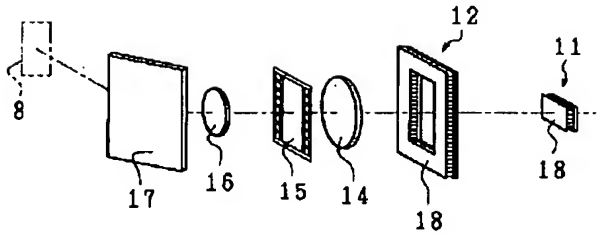


[Drawing 10]

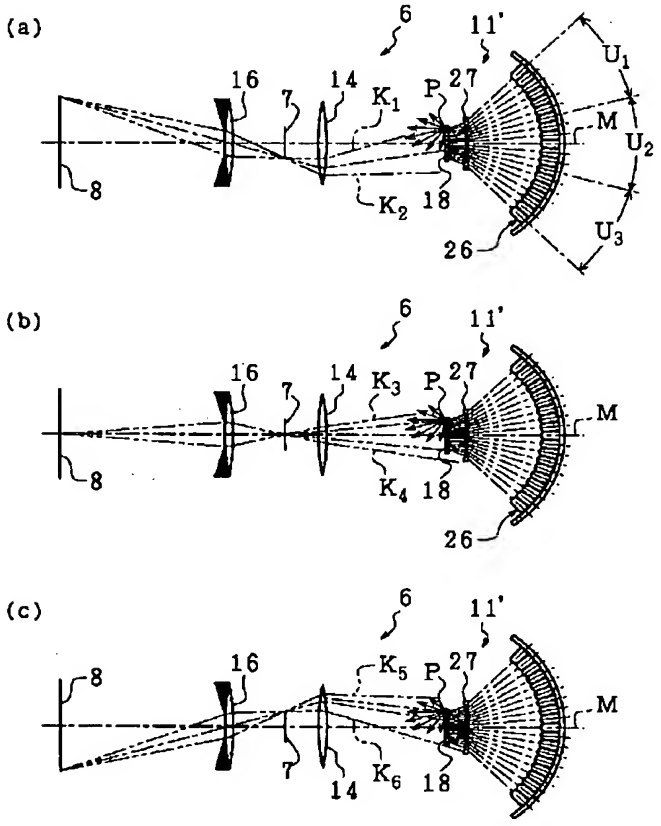
(a)



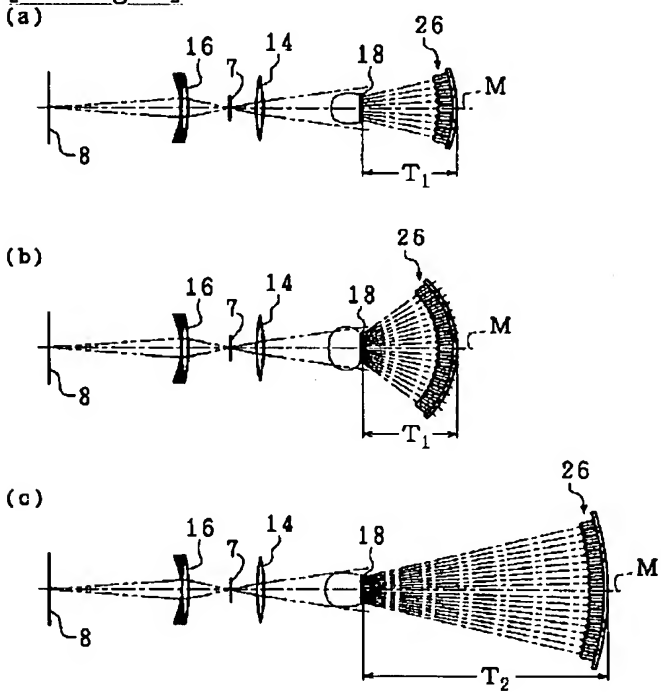
(b)



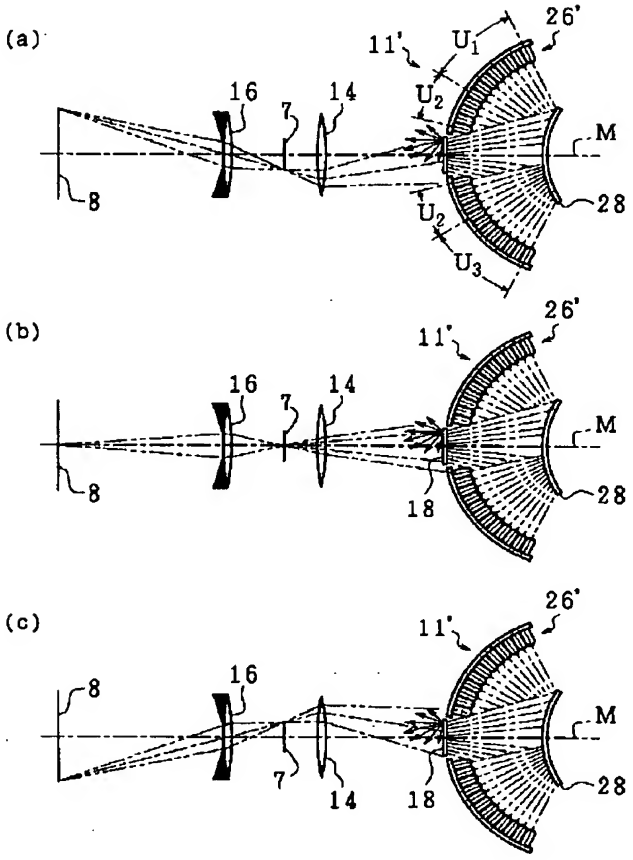
[Drawing 11]



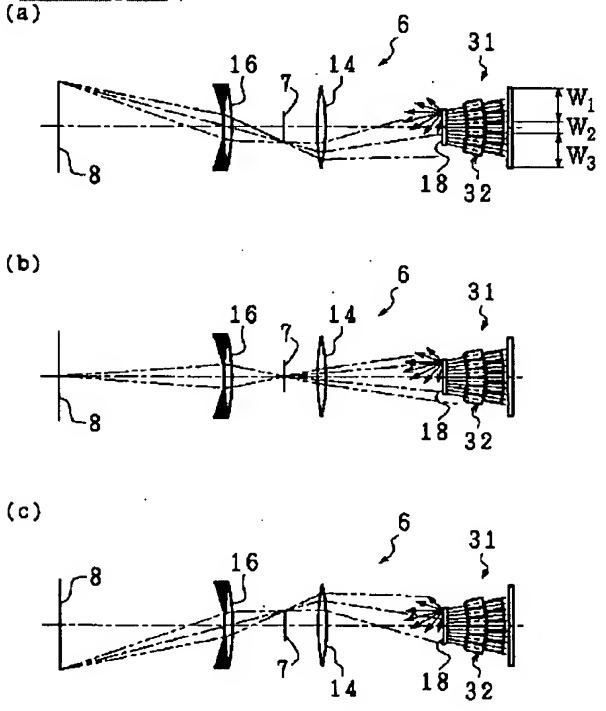
[Drawing 13]



[Drawing 14]

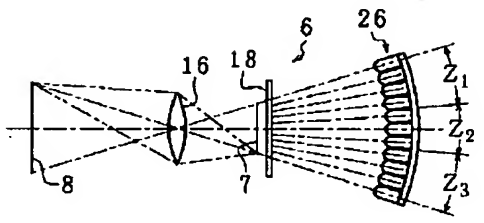


[Drawing 15]



[Drawing 16]

(a)



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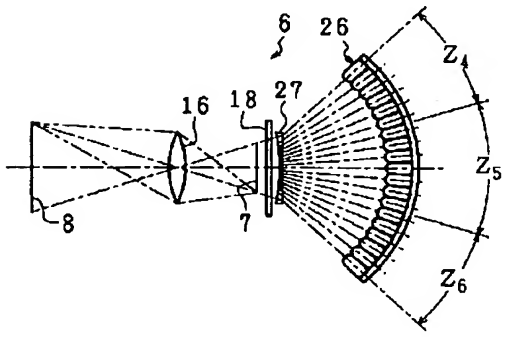
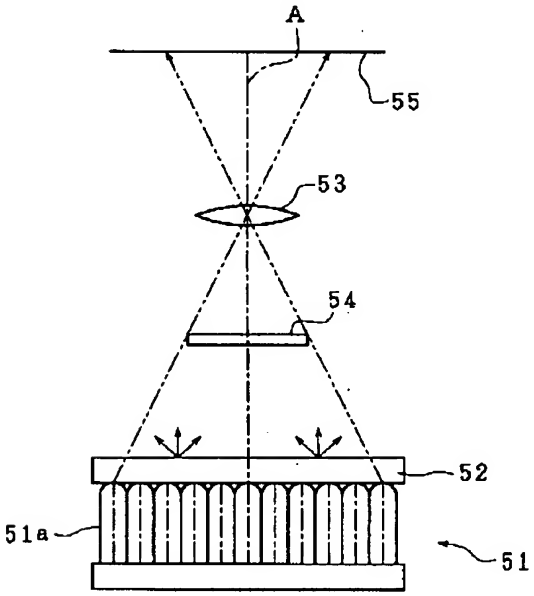
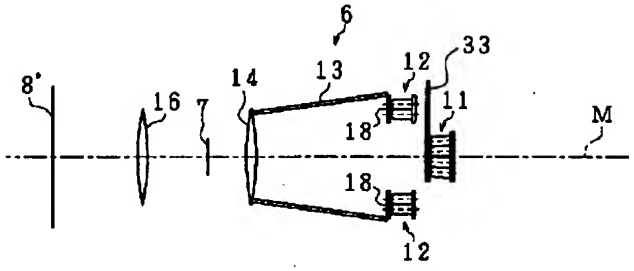


[Drawing 21]

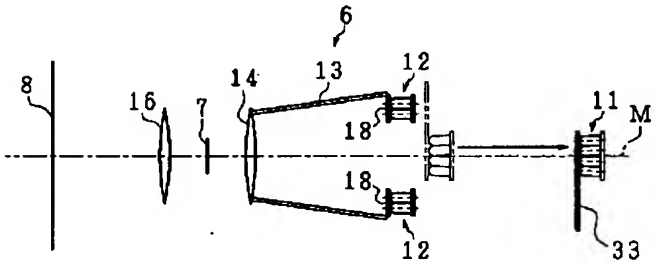


[Drawing 17]

(a)

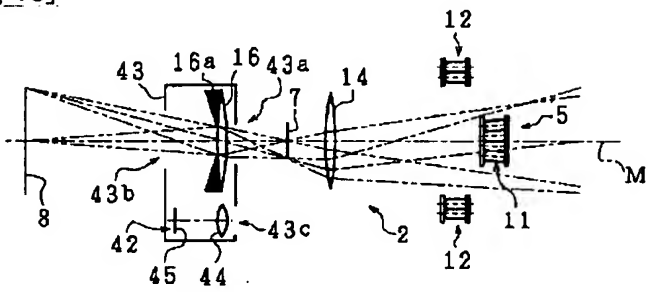


(b)



[Drawing 18]

(a)



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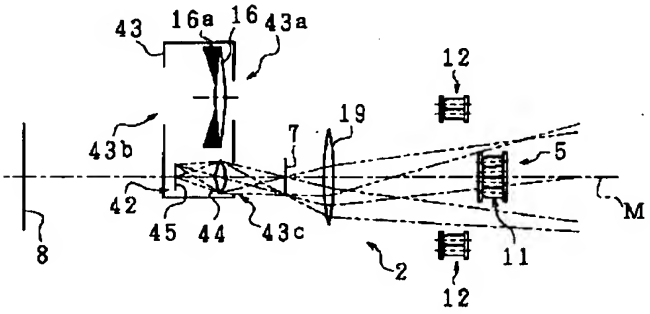

[Translation done.]